Rationales for Animal Species Considered for Species of Conservation Concern

Sierra National Forest

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Introduction

A species of conservation concern is a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area (36 CFR 219.9). The definition of SCC is found at 36 CFR 219.9(c), and criteria for identifying them are outlined in the Forest Service Handbook FSH 1909.12 Chapter 10, Section 12.52c. In coordination with the Sierra National Forest, and pursuant to responsibilities and authority under the 2012 Planning Rule (36 CFR 219.7(c)(3)), the Regional Forester determined the terrestrial wildlife, aquatic wildlife, and plant species meeting the criteria for species of conservation concern (SCC) for revision of the Sierra National Forests' Land Management Plan and Revised Draft Environment Impact Statement (FEIS) (Moore 2019). This document presents the rationales of animal species considered for species of conservation concern.

Species of Conservation Concern Compared to Forest Service Sensitive Species

During the evaluation of species of conservation concern, approximately 70 terrestrial and aquatic animal species were considered, including consideration of all species on the Region 5 Regional Forester's sensitive species list for the Sierra National Forest. The Regional Forester's sensitive species list of wildlife, fish, and invertebrate sensitive species on the Sierra National Forest are based on the September 9, 2013 versions of the USDA Forest Service Pacific Southwest Region Sensitive Animal and Plant Species by Forest[1]. In general, sensitive species were determined not to meet the established criteria as a species of conservation concern for one or more of the following reasons:

- It is a federally recognized threatened, endangered, proposed, or candidate species under the Endangered Species Act and would be considered under that other category of at-risk species.
- The species does not have a known occurrence on the national forest.
- Previous occurrence records were determined to be incorrect identifications of the species and/or could not be re-located.
- Recent surveys indicated the species is more common than originally thought.
- Natureserve, California Natural Diversity Database, California Native Plant Society Rare plant inventory, or other best available scientific information or data sources indicate threats to the species were not substantial.
- There was no information about threats to the species. This was a relatively uncommon circumstance, because information about threats could be inferred from threats to the ecosystems upon which the species depend. Lack of information generally only limited species inclusion on

[1] https://www.fs.usda.gov/main/r5/plants-animals/wildlife

the list if the species had not been observed for decades or more, leading to uncertainty about the condition of its specific habitat.

The specific reasons a species was determined to meet or not meet the established criteria as a species of conservation concern are provided in the species rationales in chapters 1 and 2.

Procedure for Evaluation of Animal Species of Conservation Concern

Species are evaluated by following a process outlined in national directive FSH 1909.12 § 12.52c-d. Species are considered using databases, scientific studies, local information and expert knowledge. Initially, we included all known or potential species within or near the administrative boundaries of the forest, providing a comprehensive list for evaluation of other criteria. The list was based on a compilation of all California Natural Diversity Database polygons from the February 2016 dataset that intersect the Forest boundaries. Some of the species included from this step were based upon over-estimated delineations of map areas, particularly from the California Natural Diversity Database dataset. Only species with reliable documentation for presence within the plan area were carried forward for further consideration. More recent California Natural Diversity Database datasets, and other datasets like eBird, were reviewed for the updated rationales in this document as referenced.

In addition to research conducted by Forest Service specialists, the national directives require use of threat status rankings, determined in large part through NatureServe[2], a non-profit organization that provides proprietary wildlife and plant conservation-related data, tools, and services. The conservation status rank of a species is represented by a letter and a number. The letter represents one of two distinct geographic scales: global (G) and state (S). The status rank number is on a scale of one to five, where a ranking of one indicates a species at the highest level of risk and a ranking of five indicates the lowest level of risk. The status rank number is preceded by the letter reflecting the appropriate geographic scale of the assessment. For example, a status rank of G5 represents a species that has an extensive range of distribution and has a low risk of extinction. Infraspecific taxa refer to subspecies, varieties, and other designations below the level of species. The status rank of infraspecific taxa (subspecies or varieties) is indicated by a supplementary T-rank, following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1.

We also consider: species listed as threatened or endangered by states or federally recognized Tribes, or identified as a high priority for conservation; species petitioned for Federal ESA listing and for which a positive "90-day finding" has been made; and other species as outlined in national directive FSH 1909.12 § 12.52c-d.

If no information on threats or concern for persistence in the planning area was available, the species was determined to have insufficient information available to conclude there is a substantial concern about the species capability to persist in the plan area over the long term, and the species was not carried forward for further consideration.

Information in the rationales was often derived from the Final Sierra National Forest Assessment (United States Department of Agriculture 2013) and associated Topic Papers and Living Assessment Chapters, the draft Biological Evaluation (Krueger 2016)), the Draft Environmental Impact Statement for Revision of the Inyo, Sequoia, and Sierra National Forests Land Management Plans (United States Department of

[2] NatureServe data tools are available at http://www.natureserve.org/

Agriculture 2016), and forest-level data, unless otherwise noted. Literature cited for those documents can be found in their respective reference sections.

Sierra National Forest Species of Conservation Concern

Based on reviews of best available scientific information for all species considered, 20 animal species met the criteria for listing as species of conservation concern for the Sierra National Forest (Table 1). Of the 19 animal species on the Regional Forester's sensitive species list on the Sierra National Forest, 12 met the criteria as species of conservation concern. In addition, 8 species not previously categorized as Region 5 sensitive species are recommended as species of conservation concern.

Table 1. Regional Forester's animal species of conservation concern for the Sierra National Forest, June 2019

Type	Common Name (Scientific name)
Birds	American peregrine falcon (*Falco peregrinus anatum*) Bald eagle (*Haliaeetus leucocephalus*) California spotted owl (*Strix occidentalis occidentalis*) Great gray owl (*Strix nebulosa*) Northern goshawk (*Accipiter gentilis atricapillus*) Willow flycatcher (*Empidonax traillii brewsteri and E.t. adastus*)
Mammals	Fringed myotis (*Myotis thysanodes*) Sierra Marten (*Martes caurina sierra*) Townsend's big-eared bat (*Corynorhinus townsendii*)
Amphibians	Foothill yellow-legged frog (*Rana boylii*) Gregarious slender salamander (*Batrachoseps gregarius*) Hell Hollow slender salamander (*Batrachoseps diabolicus*) Kings River slender salamander (*Batrachoseps regius*) Limestone salamander (*Hydromantes brunus*)
Fish	Central Valley hitch (*Lavinia exilicauda exilicauda*) Hardhead (*Mylopharodon conocephalus*) Kern Brook lamprey (*Lampetra hubbsi*)
Terrestrial Invertebrates	Indian Yosemite snail (*Monadenia yosemitensis*) Merced Canyon shoulderband (*Helminthoglypta allynsmithi*)
Aquatic Invertebrates	An isopod (*Calasellus longus*)

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Chapter 1 – Rationale for Animal Species Meeting Criteria for Species of Conservation Concern

Birds

American peregrine falcon - *Falco peregrinus anatum*

Is there scientific information to conclude that there is substantial concern about species capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

American peregrine falcon individuals may face threats primarily from environmental toxins, habitat loss, human disturbance, and illegal take (NatureServe 2015c).

Rationale for American peregrine falcon

NatureServe Global Rank: G4

NatureServe T Rank: T4

State Rank: S3S4

Other Designations: CA-Fully Protected; BLM-SS; USFWS-BCC

The peregrine falcon has a global ranking of G4, and the American peregrine falcon subspecies has a ranking of T4 indicating it is Apparently Secure, which is defined as “uncommon but not rare; some cause for long-term concern due to declines or other factors.” (NatureServe 2015c). The California State ranking of S3S4 indicates a range of uncertainty about its status in the State which lies between Vulnerable and Apparently Secure (NatureServe 2015c).

Peregrine Falcons breed throughout North America and the world (White et al. 2002). Three subspecies occur in California. Two subspecies migrate through or winter in California: Peale's peregrine falcon (*F. p. pealei*) breeds along the Pacific Northwestern coast from Alaska to Washington and winters south to Baja California, and the Arctic peregrine falcon (*F.p. tundrius*) breeds in the Arctic tundra and winters from Mexico to South America (White et al. 2002). The American peregrine falcon (*F. p. anatum*) is the focus of this rationale, and is the only subspecies that breeds in California. The American peregrine falcon, while mainly a resident, may also experience short-range migrations and dispersal in response to seasonal availability of prey resources (primarily waterfowl and other waterbirds) (Earnheart-Gold and Pyle 2001, White et al. 2002, NatureServe 2015c).

American peregrine falcon populations declined drastically during the 1950s through the mid-1970s as a result of poisoning, mainly from organochlorine insecticides such as DDT (USFWS 1999). Following the ban on these pesticides and assisted by peregrine falcon reintroduction efforts, peregrine populations have recovered significantly (NatureServe 2015c). Breeding Bird Survey data for California indicate a non-

significant increase from 1966-2013 (+2.98% per year), and from 2003-2013 (+3.80% per year) (Sauer et al. 2014). Christmas Bird Count data from across North America show a significant increase from 1966-2013 (+4.4% per year) (Soykan et al. 2016). A population viability analysis found that the Peregrine Falcon population in California was increasing, with an estimated 210 individuals in 1992 and 350 in 2012 (Wooten and Bell 2014).

Peregrine Falcons breed across a wide range of biomes in the Americas, though no habitat type appears to be preferred (White el al. 2002). Peregrine falcons typically nest on remote cliff-faces. Since recovery from its pesticide-related population crash, they have also begun nesting in urban areas, and on man-made structures including power-line towers, buoys, tall buildings and large bridges (White et al. 2002). They winter primarily along the coast and in wetland areas inhabited by large numbers of waterfowl. Peregrines prey almost entirely on other bird species, although mammalian and other prey are occasionally taken (White et al. 2002). Peregrine falcons breed and forage across a wide range of habitats in California, including hardwood or conifer forests, chaparral or other shrublands, grasslands, and urban areas, though no habitat type appears to be preferred (White et al. 2002, NatureServe 2015c).

In general, there are currently relatively few threats to peregrine falcons or their habitats. The opportunistic use of widespread habitats for nesting helps mitigate against effects of disturbance or anthropogenic changes to remote nesting sites, although low-level disturbance from rock-climbing activities has been documented (White et al. 2002). Peregrines living in urban areas of California are vulnerable to accumulation of polybrominated diphenyl ethers (PBDEs) (Newsome et al. 2010). PBDEs are flame retardants that are used on consumer goods, and have largely been phased out of products due to their detrimental effects on humans and wildlife (Newsome et al. 2010). The PBDEs present in the environment and wildlife have significantly declined in the San Francisco Bay area due to prohibition of specific fire retardants in consumer goods; likely reducing the threat of PBDEs to peregrine falcon populations in California (Sutton et al. 2014). Shooting of adults was a problem during the first half of the 1900s, but this activity has almost completely ceased. Primary causes for concern currently include illegal raiding of nests for chicks by falconers and collisions with man-made structures, including wind turbines (White et al. 2002). In contrast to other raptors which are at high risk, falcons are ranked as moderately at risk of negative population level effects from collisions with wind turbines (Beston et al. 2016). The predicted effects of climate change on peregrine falcon population sizes are mixed. Peregrine falcons in the Sierra Nevada are considered moderately vulnerable to climate change (Siegel et al. 2014c).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

According to California Department of Fish and Wildlife nest records, approximately 29 nesting attempts were recorded on the Sierra NF from 1993-1997 in Fresno and Madera Counties at 6 different sites: Balloon Dome, Fuller Buttes, Tollhouse Rock, Sunset Point, Shuteye Peak, and Garlic Falls. A total of 7 nests successfully fledged 16 young (CDFW data). There are 209 detections for American peregrine falcon in the NRIS database. The eBird database shows 3 different sightings of peregrine falcon on the forest within the last 3 years, including a suspected nesting individual in the vicinity of Shaver Lake (Musick Mountain) in 2016. The Sierra Nevada Bioregional Monitoring Project has been collecting monitoring data since 2009 and had one peregrine observation in 2012 on the Bass Lake Ranger District. Peregrine falcon are known to occur on the eastern boundary of the Exchequer Forest Restoration Project (USDA 2017). Current population trends or occupancy rates for the species on the Sierra NF are unknown.

Key ecological conditions for this species

This species occupies multiple ecosystem types containing rocks (canyons, cliffs, ledges, and talus slopes, cliffs), and or manmade habitat (buildings, bridges). The primary limiting factor for the peregrine falcon is cliffs for nesting; falcons breed near open waters like lakes, ponds, rivers, or wetlands.

According to Verner and Boss (1980), optimal habitat for peregrine falcon does not occur in the Sierra Nevada, although suitable habitat for intermediate density or use is available. On the Sierra NF, cliff nesting habitat within close proximity to high quality foraging habitat (e.g. waterfowl rich lakes and streams) occurs on the High Sierra and Bass Lake Ranger Districts. Shaver Lake, San Joaquin River area, and Bass and Huntington Lakes are popular recreation areas which could also provide ample foraging opportunities and potential nesting habitat. The South Fork San Joaquin River is considered potential peregrine nesting habitat, listed as having outstandingly remarkable value. Additional potential habitat also occurs throughout the North and Middle Forks of San Joaquin River.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

It is not currently known how many acres of suitable cliff habitat are located on the forest, although presumably this number remains unchanged from the reference condition.

The San Joaquin River area is under consideration for Wild and Scenic River Status. Its sheer canyon walls may provide potential nesting habitat for peregrines while river waters attract a variety of potential prey species. Much of the river corridor is in Ansel Adam Wilderness. In total, there are 22 miles of river under consideration. There is also potential peregrine habitat along the middle fork (segment 2) of the Kings River.

The projected status of those ecological conditions relative to the species considered

Large cliffs, caves, and cave-like habitats should remain stable, however increased pressure from recreational rock climbing could negatively affect nesting behavior.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Areas adjacent and within the national forests boundaries are projected to continue to increase in population. This growth is expected to increase recreation demand and numbers of visitors in the future (English 2014). There is a trend toward greater utilization of the forest overall as the population in the central valley and California increases. Impacts from unmanaged recreation are often found in riparian areas, areas adjacent to the urban interface, areas of intense recreation use, and outside of developed recreation sites on the national forests. Examples of unmanaged recreation which might affect peregrine falcon include development of rock climbing routes at newly discovered crags, and dispersed camping in sensitive ecosystems such as riparian areas. In addition, hikers may also cause disturbance by hiking up into peregrine nesting habitat along cliffs areas (Kim Sorini-Wilson; A. Roberts pers. comm).

While rock-climbing did not account for one of the forest's 10 most popular activities in 2012, disturbance of nests from recreational rock-climbing activities may still be a risk factor. Some key recreation sites or areas on the Sierra NF where nesting peregrines have been observed in the past include Shaver Lake and vicinity, and Tollhouse Rock, which is popular among rock climbers on the forest's western boundary. Overall recreation in the San Joaquin River area is considered light; fishermen and

hikers are the most frequent visitors. Rock climbing occurs on the granite walls and domes near the north and middle-forks where it is also listed as an outstandingly remarkable value.

Pesticides/chemicals and wind turbines are other potential risks for this species, however there have been no documented cases of poisoning for this species on the forest. There are no windfarms in close proximity to the forest and no mortalities resulting from collisions have been reported or observed. The Forest has no transmission corridors, and there are no existing or planned transmission corridors as identified in the West-Wide Energy Corridor Final Programmatic Environmental Impact Statement Nov 28 2008 and Record of Decision Jan 14 2009 passing through the Sierra National Forest.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit.

American peregrine falcon is globally secure; however under the California State ranking some uncertainty exists as to whether it is secure or vulnerable. Peregrine falcons are a current resident of the Sierra NF and have been observed foraging and nesting there. Data on population trends is unavailable, however, existing habitat is expected to remain stable for this species. Mortality from poisoning and or wind turbines have not been observed on the Sierra NF. With increasing human population levels and recreation demands, the risk of nest disturbance resulting from recreational rock climbing and other activities that may be co-located in peregrine habitat is expected to increase in the future. In addition, falconers can get permits to collect falcons; this permitting process is outside Forest Service management authority. There is substantial concern for this species' ability to persist on the planning unit. Based upon the evidence and supporting best available science, American peregrine falcon meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Bald eagle - *Haliaeetus leucocephalus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Habitat loss, human disturbance, and energy development.

Rationale for bald eagle

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S2

Other Designations: CA-Fully Protected; FS-SS; BLM-SS; CA-SGCN; USFWS-BCC

The bald eagle has a global ranking of G5, Secure "common; widespread and abundant". The ranking of S3 in California indicates the bald eagle is Vulnerable (NatureServe 2015c). The bald eagle was listed as endangered by USFWS on March 11, 1967 and down-listed to Threatened on July 12, 1995. The bald eagle was federally de-listed on August 8, 2007. The bald eagle is currently protected under the Bald and Golden Eagle Protection Act of 1940, and remains listed as endangered in California by the California Department of Fish and Wildlife.

Based on extensive survey data, breeding populations in 1997 were estimated at 142 pairs in California and 2 pairs in Nevada, and wintering populations were estimated at 574 individuals in California and 90 individuals in Nevada (Buehler 2000). The annual Midwinter Bald Eagle Survey from 1986-2010 showed a significant increase in population for the conterminous United States (+0.6%), positive trends in the northeast (+3.9%) and northwest (+1.1%), and a negative trend in the southwest (-2.2%) (Eakle et al. 2015).

Breeding season timing in California varies significantly, generally correlated with elevation, with breeding season beginning earlier in lower elevation areas. Breeding season generally occurs from February through July; but may start as early as November (Zeiner et al. 1990a). Pair initiation begins in January and egg-laying occurs from March through early May. Clutch size is 1 to 4 eggs (Evans 1982, Zeiner et al. 1990a). Incubation is usually 34 to 36 days (Evans 1982, Zeiner et al. 1990a) and fledging occurs at 10 to 12 weeks (Evans 1982). Semi-altricial young hatch asynchronously (Zeiner et al. 1990a). Bald eagles are monogamous, and breed first at 4 to 5 years (Zeiner et al. 1990a).

Bald eagles require open water with abundant food resources with adjacent mature trees or steep cliffs for nesting, perching, foraging, and roosting (Murphy and Knopp 2000). This species typically perches in "large, robustly limbed trees, on snags, on broken topped trees, or on rocks near water" (Peterson 1986, Laves and Romsos 2000). Bald eagles are primarily fish eaters; however, they are opportunistic and will utilize avian and mammalian prey and carrion if readily available, especially in the nonbreeding season (Evans 1982, Zeiner et al. 1990a).

Suitable perch sites directly adjacent to foraging areas are important habitat features as eagles often hunt from perches, swooping down to seize fish from the water. (Evans 1982, Zeiner et al. 1990a). Preferred perch trees are larger in diameter and taller than the dominant tree canopy, particularly trees greater than 100 cm (40 in) diameter at breast height, greater than 30 m (98 ft) tall, and dead topped trees with robust, open branch structures. Perches function as resting, preening, foraging and feeding sites for bald eagles. Ninety six percent of the perch sites (n=23) identified by Laves and Romsos (2000) were located within 0.25 miles of a large, open body of water.

In northern California nest territories are typically within conifer stands with most nests in ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*) and sugar pine (*Pinus lambertiana*). Nests are generally within one of the tallest trees in the stand, and the majority of nest trees have an unobstructed view to a water body (Lehman 1979). In California, large diameter trees are used for nesting, with an average of 109 cm, (43 in) DBH (Anthony et al. 1982). Nest trees must be sturdy to support the large, heavy stick nests built by this species. Most bald eagle nests are located within 1.6 km (1 mi) of a large body of water (Lehman 1979, Anthony et al. 1982).

Bald eagles may roost communally in winter in dense, sheltered, remote conifer stands (Zeiner et al. 1990a). Roost trees are perches where one or more bald eagles rest at night and may occur long distances from open water bodies. Roost trees are similar in structure compared to perch trees; "dominant trees that have open and robust branches, are sometimes defoliated (i.e., snags), are protected from prevailing winds, and are typically far from human development" (Anthony et al. 1982). Availability of food resources plays a central role for migrating and wintering eagles, and increases in available prey are highly correlated with bald eagle abundance and habitat use (Restani et al. 2000, Elliott et al. 2011).

The most significant threat to survival of the bald eagle in the 20th century was the widespread use the organochlorine pesticide DDT which interfered with normal calcium metabolism and caused abnormalities in bald eagle eggshells, resulting in widespread nesting failures and population declines. In the decades following the 1972 ban on DDT's agricultural use in the United States, bald eagle populations

recovered significantly. There are several remaining threats to bald eagles populations, with the most significant being habitat loss and human disturbance.

Threats to habitat include any source of extensive tree mortality within suitable nesting and perching habitat adjacent to large lakes and rivers that support bald eagle food supplies. High severity fire can eliminate large tree nesting and perching habitat. Extensive tree mortality caused by insects and diseases also remove suitable habitat. Additional threats to habitat include degradation of aquatic habitats that affect fish populations that serve as the bald eagles' primary food source. Exceptional drought conditions can increase tree mortality as well as reduce reservoir levels and prey availability. Climate change could potentially accelerate the rate at which habitat is lost.

A variety of human activities can potentially interfere with bald eagles, affecting their ability to forage, nest, roost, breed, or raise young. Territories have been abandoned after disturbance from logging, recreational developments, and other human activities near nests (Zeiner et al. 1990a).

Bald eagles may not begin nesting if human disturbance is present near nests (Zeiner et al. 1990a). Human recreational activities such as boating, jet-skiing, fishing, and low flying aircraft can cause disturbances to nesting birds, but this species also shows a moderate tolerance for the presence of humans (Buehler 2000). Not all bald eagle pairs react to human activities in the same way. Some pairs nest successfully just yards from human activity, while others abandon nest sites in response to activities much farther away. This variability may be related to a number of factors, including visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the individual nesting pair.

Human disturbance can also affect foraging activity. Recreational use of lakes and extensive shoreline development have reduced available foraging habitat (Evans 1982). In Washington, bald eagles have been found to be adversely affected by recreation that involves both pedestrian traffic and boat use by adversely affecting feeding activity (Stalmaster and Kaiser 1998). Wintering bald eagles may also be adversely affected by human disturbance and eagle distribution patterns can be significantly changed by human activity (Stalmaster and Newman 1978). Eagles were displaced in areas of high human activity and moved to areas of lower human activity. Flush distances were lower when the disturbance was on land than in the water and lower still if the eagle couldn't see the cause of the disturbance. Disturbance from human recreational activities such as boating, jet-skiing, fishing, and low flying aircraft which can cause disturbances to nesting birds is a potential threat (Buehler 2000). Camping within 100-m of a Bald Eagle nest can lower the amount of prey consumed (-26%) and prey fed to nestlings (-29%) relative to activity observed when camping is restricted to at least 500-m from nests (Steidl and Anthony 2000).

The US Fish and Wildlife Service has provided recommendations for reducing disturbance to bald eagles, as well as recommendations for habitat management. The National Bald Eagle Management Guidelines contain recommendations for reducing disturbance at nesting, foraging, and communal roosts from a variety of human activities. These recommendations provide direction on how to reduce the effects of human disturbance on bald eagles (United States Department of the Interior 2007).

Additional threats to bald eagles include poisoning (especially lead poisoning), electrocution, collisions with electrical lines, and shooting. Natural predation is restricted to nests and is rare, and diseases and parasites have been observed but apparently contribute little to mortality.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Bald eagles occur in Sierra National Forest throughout the year especially at or near reservoirs, lakes and large rivers. Bald eagles are also known to winter along the middle fork (segment 1) of the Kings River. Most recently, winter observations were recorded at: Bass Lake; Shaver Lake; Mammoth Pool Reservoir; Redinger Lake; Lake Edison; and Florence Lake (Southern California Edison Company 2011). Five active night roosts were identified in 2011 at three of the reservoirs. Nesting was documented at four of six reservoirs surveyed in 2011. Know nest sites are at Bass and Shaver Lakes, and Lake Edison (USDA 2017). The Sierra NF has 852 records for bald eagle in the NRIS database (many of these records occur at the same location but were collected at different times). According to the forest plan DEIS, the bald eagle population in the southern Sierras is believed to be stable or slightly increasing and the Sierra NF Assessment (Chapter 5 2013 Snapshot) also notes the population as stable to possibly increasing on the Forest.

Key ecological conditions for this species

Bald eagles utilize large conifer stands (Jeffery pine and mixed conifer) where there is access to open water (e.g. lakes or reservoirs) or free flowing rivers for foraging, typically within one mile of large trees (40 in dbh) and greater than 98 ft. tall, snags, and or dead top trees.

On the Sierra NF, the mixed conifer zone typically consists of ponderosa pine, sugar pine, incense cedar, and white fir, and some Douglas-fir. In the montane zone, mid seral coniferous forests comprise 20 percent of the landscape, hardwood and mixed hardwood -conifer forests comprise 15 percent, and late seral closed canopy coniferous forests comprise 11 percent, with shrublands at 10 percent.

There are more than 1,500 miles of stream occupied by fish, 11 large reservoirs (greater than 150 acres), and 7,500 acres of lakes distributed across the Sierra National Forest. There are reservoir fisheries; high mountain lake fisheries; as well as both warm and coldwater fisheries which provide a variety of fish species for bald eagle. Reservoir fisheries exist where dams established as part of hydroelectric power development or flood control has created lakes.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Risk of loss of habitat and habitat fragmentation of conifer forest from wildfire outside the natural range of variability. While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sierra NF, substantial areas are at very low fire resiliency index and susceptible to higher amounts of crown fire than expected. Total annual burned area is far below historic levels (Stephens et al. 2007, North et al. 2012) resulting in denser, more uniform forests and shrubfields (Collins and Skinner 2013). This in turn has led to more uniform, high severity fires (van Wagtendonk and Fites-Kaufman 2006, Miller et al. 2009, Collins and Stephens 2010, Miller and Safford 2012).

Live and dead fuels have increased to abnormally high levels of abundance, greater than the natural range of variability. This results in forests that are highly susceptible to the types of large-scale, high-severity fire which can negatively affect long term forest sustainability and eliminate or substantially alter older-age forests that contain large trees that are critical to species like bald eagle, marten, and black-backed woodpecker. The Sierra NF landscape has experienced decades of fire exclusion and according to the forest wide assessment the mean fire return interval is highly departed for mixed conifer forests (+40% to greater than 85% mean frequency departure) in most areas of the forest.

The forest assessment for the Sierra, notes that the number of large trees and snags are low and highly variable across all forest types. In all conifer types, there is less than 5 large trees (less than 30 inch diameter) per acre. In addition, the densities vary radically across the landscape as large trees are not evenly distributed. Most areas have a few large trees per acre and some patches, often previously disturbed (timber harvest or wildfire), have none or they are unevenly distributed across the landscape. Very large tree (trees > 40" dbh) densities are typically less than one to two trees per acre. Again, many areas are devoid of large trees. In conifer-hardwood forests, large tree levels are also somewhat low, with trees < 24" dbh ranging from 4 to 6 per acre. Large snags show similar patterns to large trees, but with lower densities and higher variation. Calculations of snags greater than 15 inches diameter show the range is from 1 to 4 snags per acre in conifer forests. As with large trees, the numbers are lower for conifer-hardwood, generally less than 3 snags per acre and numbers are calculated to be even lower in the oak woodland. Snags are especially variable in distribution with some patches containing large numbers from recent wildfires or where insects or disease killed groups of trees and other areas containing few dead trees. Large snags can stand for longer periods of time (decades) than smaller diameter snags (often less than a decade).

The Sierra National Forest has incurred tree mortality in recent years (USDA 2017). Approximately 1/3 of the Forest has died and it continues to move up in elevation. The majority of the ponderosa pine belt has died. Bark beetles have created areas with dead trees greater than 10" DBH. Moderate and dense tree cover was most heavily affected by drought and bark beetle related tree mortality. As of the 2017 aerial survey flight data, mortality is becoming more evident at the higher elevations, primarily in white and red fir, as compared to previous years where most of the extensive mortality was observed in lower elevation pine and mixed conifer forests. Mortality in the low elevation pine of the southern Sierra Nevada range is greatly reduced due to lack of viable host and more normal precipitation conditions. However, low elevation pine mortality elsewhere is common. An overview of tee mortality is shown in Table 2, see the northern goshawk section for a detailed description of the impacts from bark beetle outbreaks on the Forest.

Table 2. Tree mortality estimates on the Sierra National Forest

Year	Estimated Acres of Mortality	Estimated Number of Dead Trees
2014	54,651	190,358
2015	381,000	5,900,000
2016	557,000	18,563,000
2017*	297,000	6,836,000

*Preliminary estimates

Stream and lake levels may be influenced by spring runoff of snowmelt; low summer/fall flows; drought; or drawdown of hydroelectric reservoirs in the fall. This may influence prey availability. CDFW provides a stocking fishery for some streams and reservoirs; a wild trout fishery; and high mountain lake fishery.

Kings River, including the entire Middle and South Forks, is a designated wild and scenic river. Six miles of the Middle Fork portion of the designation are on the Sierra NF (Sequoia and Kings Canyon National Parks also manage portions of the Kings Wild and Scenic River).

The projected status of those ecological conditions relative to the species considered

The biggest risk factor for bald eagle is inadequate number, distribution, and quality of large living trees and dead trees (snags) of sufficient density, size, area and age. In general, large scale uncharacteristically

severe wildfire are expected to increase in frequency and intensity, poses a risk to bald eagle habitat. Bark beetle outbreaks are expected to further exacerbate already dry conditions and increase fire risk, but will also provide opportunities for snag recruitment.

The following estimates show projected trend (2012-2032) for each forest type potentially used by bald eagle. Approximate percentage of each habitat type on the Sierra NF are in parentheses.

Coniferous Forest, Mid Seral (19.9): Gradual decreasing trend. Major loses are projected if large scale, high intensity fires occur in these forests due to high fuel loads.

Coniferous Forest, Late Seral, Closed Canopy (11.5): Gradual increasing trend as the large amounts of mid-seral stands progress into late-seral forests. The continued management framework would retain nearly all trees >30 inches dbh, thus increasing the number of stems per acre.

Coniferous Forest, Late Seral, Open Canopy (0.2): This small amount of habitat is predicted to remain stable although possibly increasing as a result of closed canopy forests shifting into open canopy forests as a result of potentially increased mortality.

Overall, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Key risk factors for bald eagle are related to recreation and activity related disturbance. Fishing opportunities and recreation uses are expected to continue and impacts from those activities will continue to occur. The California Department of Wildlife is expected to continue the fish stocking program in many of the lakes. Reservoirs will continue to exist under current management and jurisdiction to fulfill their water storage and hydroelectric needs. No change in management is expected to occur within the next 20 years for reservoirs.

In the King's River Area, gang activity has been documented which may include marijuana grow sites containing harmful rodenticides. There are also places in this area where there is high use by the public which leads to trash and sanitation issues. Because bald eagles are opportunistic scavengers this could lead to mortality.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Bald eagles are currently known to use the Sierra NF for wintering and nesting/breeding and according to the Sierra NF assessment, the bald eagle population on Sierra National Forest is currently stable and possibly slightly increasing. However, recent widespread tree mortality related to bark beetle outbreaks pose a considerable risk to availability of the large live tree component, and habitat loss resulting from high intensity fires continues to be a potential threat as is disturbance from recreationists. There is substantial concern for this species' ability to persist on the planning unit. Based upon the evidence and supporting best available science, bald eagle meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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California spotted owl - *Strix occidentalis occidentalis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Habitat loss, degradation, or loss of connectivity from high severity fire and management activities such as timber harvest; expansion of barred owls, climate change, pesticides and carbonates, and reduced genetic diversity.

Rationale for California spotted owl

NatureServe Global Rank: G3

NatureServe T Rank: T3

State Rank: S3

Other Designations: FS-SS; CA-SSC; CA-SGCN; BLM-SS; USFWS-BCC

The California spotted owl has a global rank of T3 (Vulnerable), a California State rank of S3 (Vulnerable), is a Region 5 Forest Service Sensitive species and a Management Indicator Species (MIS) representing late seral closed canopy coniferous forest. The USFWS is currently reviewing this species after a positive 90-Day Finding to determine if the species warrants protection under the Endangered Species Act. This species is also recognized as a California Species of Special Concern and a Species of Greatest Conservation Need.

While there are no rigorous estimates of population size for the California spotted owl, an attempt was made to estimate the population size using data from California Department of Fish and Wildlife and consists of 1,865 owl sites, with 1,399 of them occurring on National Forest System lands (United States Department of the Interior 2006). Caution should be used in the interpretation of these estimates because they represent all recorded sites from the past 30-40 years and current occupancy of these sites is unknown. Population trends from four demographic study areas in the Sierra Nevada suggest that the populations may be declining on National Forest System lands on the Eldorado, Lassen, and Sierra National Forests, and may be stable or increasing in the Sequoia Kings Canyon study area (Conner et al. 2013, Conner et al. 2016, Tempel and Gutierrez 2013, Keane 2014, Tempel et al. 2014). It is important to note that the 95 percent confidence interval for lambda, rate of population change, overlaps with 1. A lambda of 1 indicates a stable population; less than 1 indicates the population is decreasing, and greater than 1 indicates an increasing population. The cause of the suspected declines are unknown at this time (Keane 2014).

California Spotted Owls primarily occupy coniferous and mixed pine-oak forests that have late stage characteristics with canopy cover and tree size being the most important predictors of California spotted owl presence (Jones et al. 2017, North et al. 2017, Wood et al. 2018). California spotted owls choose roosts and nest sites in microhabitats within areas of dense vegetation, dense canopy cover, and complex, multi-story forest structure (Tempel et al. 2016, USFWS 2017). Being cavity nesters, they require snags or decadent trees that have cavities or mistletoe platforms, such as black oaks, multi-forked firs, or broken top incense cedars. Snags and large downed woody debris are required as they provide habitat for important prey species including northern flying squirrels and mice.

California spotted owls are long-lived and exhibit sporadic reproduction in response to environmental conditions and therefore are slow to recover from population declines. They are territorial, defending non-overlapping nesting territories.

Threats to persistence of California spotted owls include habitat loss, degradation, or loss of connectivity from high severity wildfire (Jones et al. 2016, Rockweit et al. 2017, USFWS 2017, Wood et al. 2018) and management activities such as timber harvest; expansion of barred owls, climate change, rodenticides, and noise disturbance (Gutierrez et al. 2017). Timber harvest has been identified as one of the most significant threats to spotted owl persistence (Gutierrez et al. 2017). Effects of vegetation treatments on persistence of spotted owl across its range are complex and not well understood. Treatments that result in a reduction of canopy cover to ≥40%, surface and ladder fuels, and vertical and horizontal stand structure, with an increase in regularly spaced trees may have negative impacts on spotted owls (Stephens et al. 2014, Tempel et al. 2014, Tempel et al. 2014a). Seamans and Gutierrez (2007) and Tempel et al. (2014) found the availability and amount of late seral forest, with canopy cover >70% and a dominance of medium and large trees >30 cm and >60.9cm, respectively, were positively correlated with territory occupancy, survival, and population growth. Habitat edge is considered beneficial to spotted owls, perhaps increasing prey populations and access to prey by foraging owls. Recent changes in silviculture prescriptions are based on historic vegetative patterns and conditions selected for by spotted owls (Knapp et al. 2012); they are designed to retain stand structure and heterogeneity. Effects of these prescriptions on spotted owl populations are unknown.

It is generally accepted that dense forest conditions, including those with large trees and high canopy cover, can be at higher risk to landscape level disturbance from high-severity wildfire. There are opposing views regarding the impact of high-severity wildfire to spotted owl habitat and owl persistence (Ganey et al. 2017). One view is that high-severity wildfire is a primary threat to spotted owls due to landscape level loss of large trees and high canopy cover, and that fuels reduction treatments that successfully reduce the

risk of high-severity wildfire can aid in sustaining desired conditions for spotted owl (Jones et al. 2016). An opposing view argues that high-severity wildfire was relatively common in many forest types occupied by spotted owls and does not pose an immediate threat, and further maintain that fuels reduction treatments are misguided because they degrade owl habitat and do not reduce the extent of high-severity fire.

Spotted owls have been documented to use habitat that has burned at low to moderate burn severity and that includes some proportion of high-severity fire (Roberts et al. 2011, Lee et al. 2012, Lee et al. 2013, Lee and Bond 2015). The amount of suitable habitat (green forest), the amount of suitable habitat that burned at high severity (Jones et al. 2016), and salvage logging likely affect continued occupancy by spotted owls (Gutierrez et al. 2016). High severity fires that results in the loss of dense mature forest, large snags and downed logs effectively remove preferred nesting and roosting habitat and can take centuries to regrow. Jones et al. (2016) concluded megafires pose a threat to spotted owls because occupancy probability for spotted owls declined by 22 % the year after the King Fire and declined by almost nine-fold in sites that burned at >50 % high severity. In the closely related Northern spotted owl, (Clark 2007) found that while spotted owls did roost and forage within high severity burn areas, the use was very low suggesting that this cover type was poor habitat for spotted owls. (Clark et al. 2011) found that annual survival rates were lower in northern spotted owls inhabiting burned areas or displaced by the wildfire as compared to owls that inhabited areas outside the burn perimeter. While short term benefits may be realized by spotted owls, such as increased prey and edge habitat, uncertainties remain regarding long-term occupancy and demographic performance of spotted owls at burned sites (Keane 2014). Specifically, uncertainty exists regarding how the amounts and patch sizes of high-severity fire will affect California spotted owl occupancy, demographics, and habitat over long time frames (Keane 2014). The results of simulation modeling research summarized in (Keane 2014) suggests that some fuels treatments can reduce fire risk and with minimal effects on owl reproduction, and may have long-term benefits of reducing wildfire risk that outweigh short-term effects of treatments.

Considerable uncertainty remains regarding the response of spotted owls to high-severity wildfire, especially over longer time frames (Ganey et al 2017). The considerable trend toward increasing extent and severity of megafires throughout the range of this owl, suggests that the cumulative effects of these fires could be significant (Ganey et al 2017). Ganey et al (2017) suggest forest restoration or fuels reduction treatments, including wider use of managed fire to reduce risk of high-severity wildfire, can be strategically located to optimize reduction of fire risk and reduce habitat loss. , There may be local impact spotted owl habitat, but reducing risk may be more beneficial overall. It is important to evaluate both the impacts of such treatments to spotted owls and the effectiveness of such treatments in mitigating fire behavior.

Barred owls are an increasing risk factor for California spotted owls in the Sierra Nevada. Barred owls can hybridize and also out-compete spotted owls. Barred owls were first recorded within the range of the California spotted owl in 1989 on the Tahoe National Forest. Two sparred owls (hybrids of spotted and barred owls) were reported in the Eldorado National Forest during 2003 to 2004 (Seamans et al. 2004). Barred owls were first recorded in the southern Sierra Nevada in 2004 (Steger et al. 2006). Ongoing research has documented 73 records of barred or sparred owls in the Sierra Nevada to date, with the majority of records from the northern Sierra Nevada (Tahoe, Plumas, and Lassen National Forests). Of note, five new records of barred owls were documented in the Stanislaus and Sierra national forests in 2012, indicating further range expansion of barred owls in the southern Sierra Nevada. In 2017, confirmed barred owls were on the Sequoia National Forest. Barred owl numbers are likely higher than documented in the Sierra Nevada, as there have been no systematic surveys for them to date.

Climate change may have negative effects on spotted owls. Increasing temperatures may affect spotted owl survival, reproduction, recruitment, and population growth (Gutierrez et al. 2016). Climate change may also result in geographic shifts in habitat distribution, abundance, and quality, increase the amount of high severity wildfire, increase large tree mortality caused by insects and disease, and change prey distribution and abundance (Gutierrez et al. 2016). Poisoning by rodenticides is considered a significant emerging threat, but there is little information available on the effects of and appropriate mitigations of this threat. Disturbance associated with human recreation and management activities is considered a threat to spotted owls and are considered localized in space and time. Protecting birds from noise disturbance during the breeding season, March 1 through August 15, can effectively mitigate acute noise and activity disturbance (Gutierrez et al. 2016).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

The Sierra NF has 240 designated California spotted owl Protected Activity Centers (PACs) (Figure 1) and 240 Home Range Core Areas (HRCAs). Surveys have been conducted since the 1980s but are not annual; it is not known how many PACs and HRCAs are currently active. There are 5,485 records of spotted owl in the NRIS database distributed across the forest with heavy concentrations south of Shaver Lake. On the Sierra National Forest, approximately 50 percent of the overall protected activity centers acreage is in the mixed conifer vegetation type.

Demographic work using data collected between 1990 and 2005 (Blakesley et al. 2010) provided estimates of lambda for all four Sierra Nevada demography study areas (a lambda of 1 indicates a stable population; less than one indicates the population is decreasing and greater than 1 indicates an increasing population). The Sierra NF had a mean estimated lambda of 0.992 (95% CI ranging from 0.966 to 1.018).

Updated analyses on population trends using data from 1990-2013 suggest the Lassen and Sierra NF study populations may have declined (Gutiérrez et al. 2017).

Key ecological conditions for this species (See above for additional details).

On the Sierra NF, the ecological conditions for spotted owl can be found in the mixed conifer dominated montane zone. Tree species typically include ponderosa pine, sugar pine, incense cedar, and white fir, and some Douglas-fir. Black oak is an important component of many mixed conifer stands, particularly at the lower elevations and on drier aspects (south and west). Potentially available habitat as classified by the CWHR (acreages in parentheses) includes the following vegetation types: ponderosa pine (73,574), montane hardwood conifer (77,455), Jeffrey pine (28,585), hardwood (148,049), red fir (141,303), sierra mixed conifer (269,921) and white fir (2,556). According to recent mapping efforts, the largest habitat coverages that contain potential spotted owl habitat conditions on the Sierra NF are mid-seral coniferous forests (19.9 percent), hardwood and mixed hardwood/conifer forests (15.1 percent), and late seral closed canopy coniferous forests (11.5 percent).

Many of the habitat attributes discussed for the California spotted owl are important to the fisher as well (USDA 2004: p. 7 of ROD). The Southern Sierra Fisher Conservation Area (SSFCA) encompasses the known occupied range of the fisher in the Sierra Nevada. This consists of an elevation band from 3,500 to 8,000 feet (errata March 2001e) on the Sierra and Sequoia National Forests. This area will be managed to support fisher habitat consistent with the protections for the owl. See the fisher rationale for more information.

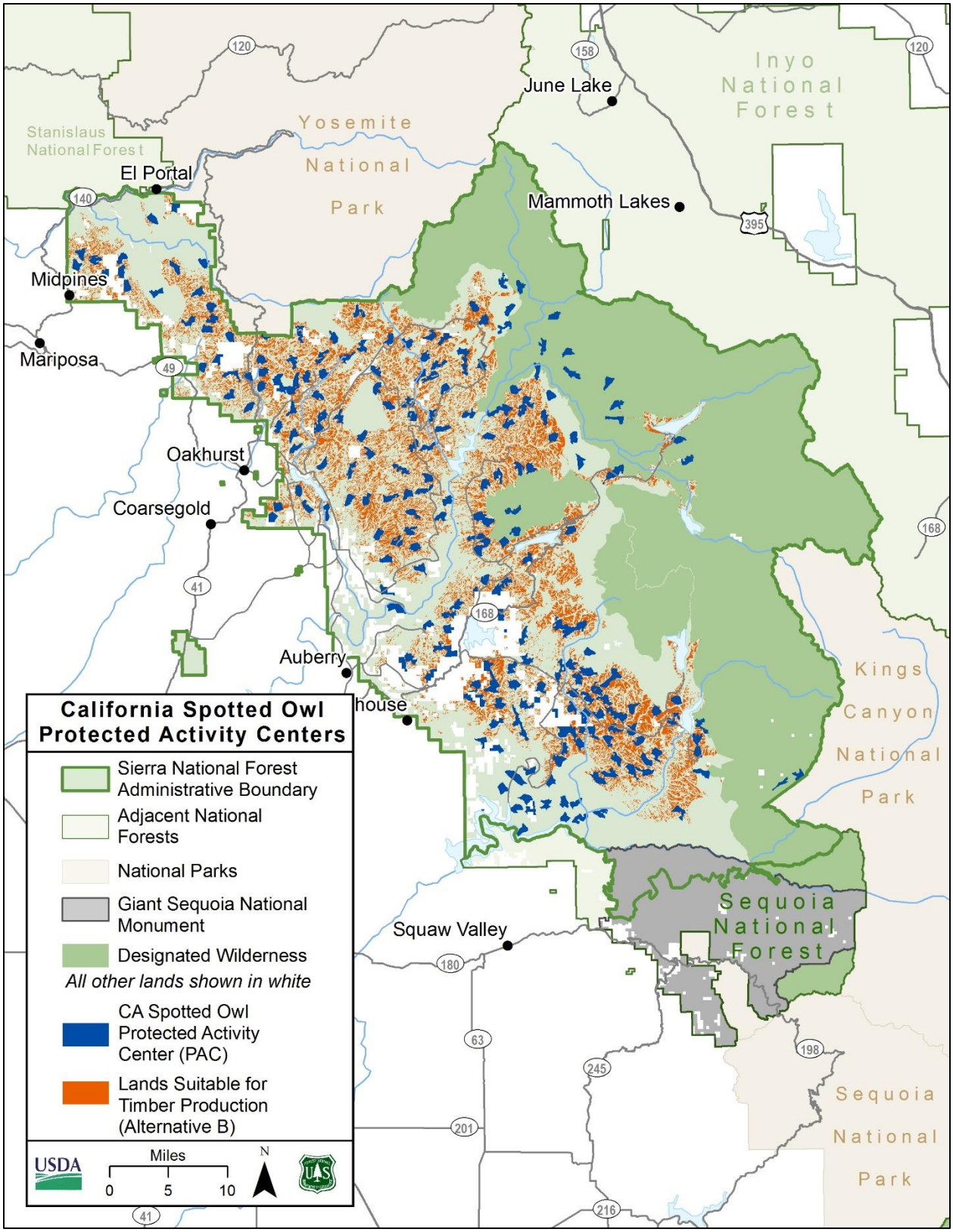

Figure 1. California spotted owl protected activity centers on the Sierra National Forest

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Nearly half (44 percent) of the area of the Sierra NF dominated by woody vegetation (or 76 percent of montane coniferous forests) is in a highly departed condition with respect to the historic fire return interval, burning at frequencies that are significantly longer than pre-settlement fire regimes (Safford and van de Water 2013). Terrestrial ecosystems are experiencing increasing tree densities and canopy cover, especially shade-tolerant species at low to mid elevations. This pattern of increasing tree density and cover in mixed conifer and yellow pine forests are supported by extensive stand reconstruction studies at the Teakettle Experimental Forest (e.g., North et al. 2007, 2009) and neighboring Yosemite National Park (Scholl and Taylor 2010), and comparisons of early 20th century versus current stand inventory data (Meyer et al. 2013a) on the Sierra and Stanislaus National Forests (Lyderson et al. 2013 and Knapp et al. 2012).

Overall, the number of large trees and snags are low and highly variable across all forest types. In all conifer types, there is less than 5 large trees (less than 30 inch diameter) per acre. In addition, the densities vary radically across the landscape as large trees are not evenly distributed. Most areas have a few large trees per acre and some patches, often previously disturbed (timber harvest or wildfire), don't have any and where they occur, they can be in clumps and patches across the landscape. Very large trees, trees more than 40 inch diameter, densities are even lower, typically less than one to two trees per acre. In hardwood conifer and hardwood types, large tree levels are also somewhat low, with trees less than 24 inch diameter in the range of 4 to 6 per acre in conifer-hardwood forests. Large snags show similar patterns to large trees, but with lower densities and higher variation. Calculations of snags greater than 15 inches diameter show the range is from 1 to 4 snags per acre in conifer forests. As with large trees, the numbers are lower for conifer-hardwood, generally less than 3 snags per acre and numbers are calculated to be even lower in the oak woodland. Snags are especially variable in distribution with some patches containing large numbers from recent wildfires or where insects or disease killed groups of trees and other areas containing few dead trees.

There are two giant sequoia groves on the forest, in the mixed conifer zone. Nelder Grove occurs in Mariposa County in the Fresno River watershed on the northern part of the forest, and McKinley Grove occurs in Fresno County in the Kings River watershed on the southern part of the Forest.

The Sierra NF has recently experienced some increased levels of fire disturbance with the Aspen fire (9000ha), Big Creek (2000 ha) and North fork (2000 ha) fires occurring in 2013, 1994, and 2001. These fires were characterized by low burn severity with pockets of moderate and high severity.

The projected status of those ecological conditions relative to the species considered

While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sierra NF, substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of the Sierra NF assessment, which indicates they are susceptible to higher amounts of crown fire than expected. Overall, continuous vegetation cover is present but within-patch diversity is greatly reduced from estimated historic conditions. This is largely due to fire suppression and past forest management, which has also resulted in high forest and vegetation densities, and very high surface fuel loads. These conditions, in combination with current and future warming and drying climate trends increase vulnerability to high intensity fires and further fragmentation of old forest habitat.

The following estimates show projected trend (2012-2032) for each forest type potentially used by California spotted owl. Approximate percentage of each habitat type on the Sierra NF are in parentheses.

Coniferous Forest, Mid Seral (19.9): Gradual decreasing trend. Major loses are projected if large scale, high intensity fires occur in these forests due to high fuel loads.

Coniferous Forest, Late Seral, Closed Canopy (11.5): Gradual increasing trend as the large amounts of mid-seral stands progress into late-seral forests. The continued management framework would retain nearly all trees >30 inches dbh, thus increasing the number of stems per acre.

The Sierra National Forest has been experiencing extreme drought and insect related (e.g. bark beetles, fir engravers) mortality and this is expected to continue. Mortality has been consistent across all major conifer with the most dramatic effects on ponderosa and Jeffrey pine and fir species. Statewide trends in 2017 showed that many areas experienced mortality at higher elevations (in the white and red fir), compared to previous years where extensive mortality was in lower elevation pine and mixed conifer forests. A summary of tree mortality from drought and bark beetle outbreaks is provided in the northern goshawk rationale.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

The spatial distribution of large trees and snags are unknown.

Key risk factors arising from non-ecosystem conditions and/or management activities

Forest Management

Starting in the early 1900s, fires were actively suppressed with the intention of "protecting forests". Years of fire suppression resulted in increased vegetation density and uniformity, an increase of less fire tolerant trees, and understory fuel loads resulting in increased fire potential (Stephens 2005, Stephens and Moghaddas 2005, van Wagtendonk and Fites-Kaufman 2006, North et al. 2009). High-severity fire and widespread loss of habitat is perhaps the biggest threat to spotted owls. Following the King Fire of 2014 spotted owl occupancy declined markedly at severely burned sites 1-year post fire, and the large patch of severely burned forest was strongly avoided for foraging (Jones et al. 2016, Gutiérrez et al. 2017).

Logging in the mid-1900s focused on selective harvest of larger trees, and on regeneration of harvested areas in the 1980s (Verner et al. 1992). On the Sierra National Forest, harvest of large trees was essentially eliminated in 1990s, and the emphasis shifted to medium and now small diameter trees. Vegetation management around nests or den sites for the California spotted owl, goshawk, fisher, and marten was heavily restricted. At the same time, a growing concern for the cumulative effects of past management and fire suppression increased the focus on restoring fire and reducing forest densities and surface fuel accumulations. Currently, most of the landscape is not resilient to large, high intensity fire, and is susceptible to drought and insect/pathogen outbreaks. Restoration is proceeding at a pace and scale that is inadequate to address the problem in a timely way. The limited pace and scale of restoration and lack of active management is a stressor.

Current research suggests strategically placed landscape treatments (mechanical treatments and managed fire) can reduce fire severity and spread (Gutiérrez et al. 2017)and reduce impacts on spotted owl habitat (Ganey et al. 2017), and that by combining fuel treatments with prescribed and managed fire can effectively reduce the extent of high-intensity fires in the Sierra Nevada under most conditions (Jones et al. 2016, Gutiérrez et al. 2017).

Interspecific competition and hybridization

Barred owl is known to hybridize with the California spotted owl, jeopardizing its genetic integrity (Keane 2014). It has been observed in the northern portion of the Sierra NF. It is unknown how many barred owls there are or how fast they are progressing south. Six barred owls were detected in the

southern Sierra Nevada during 2011–2012 (Keane 2014). It is considered a strong possibility that barred owls will ultimately colonize the entire Sierra Nevada and become a strong threat to California spotted owl (Gutiérrez et al. 2017).

Disease

There has been no evidence to indicate that West Nile Virus has affected California spotted owl populations. Hull et al. (2010) screened samples for WNV antibodies from 209 California spotted owls collected from the southern (Sierra National Forest, Sequoia and Kings Canyon National Parks) or northern (Plumas and Lassen National Forests) Sierra Nevada during 2004–2008 and results were negative for all 209 California spotted owls (Gutiérrez et al. 201).

Climate Change

Terrestrial ecosystems of the Sierra NF are expected to experience dramatic changes in climate in the coming decades (Meyer and Safford 2013, Safford et al. 2012). Consequently, the future range of variation in climate exposure for these ecosystems will almost certainly exceed the natural range of variation. Schwartz et al. (2013) evaluated future climate exposure to vegetation using downscaled climate projections for the southern Sierra Nevada, including the Sierra and Sequoia National Forests. Their results indicate a high proportion of all terrestrial ecosystems will be moderately, highly, or extremely vulnerable to future climate by the end of the century.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The best available science indicates declining population trends throughout the California spotted owl range, low fecundity, high juvenile mortality, and habitat specificity. These life history characteristics combined with relevant threats and stressors, including habitat loss resulting from high severity fires, drought, and beetle outbreaks indicate substantial concern about the California spotted owls capability to persist over the long-term in the plan area. Climate change and potential drought related effects will likely continue to exert pressure on the key ecological conditions that this species depends upon. There is substantial concern for this species' ability to persist on the planning unit. Based upon the evidence and supporting best available science, California spotted owl meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Great Gray Owl - *Strix nebulosa*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? **Sufficient**

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? **Yes**

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Small population size, meadow and adjacent forested habitat degradation or loss from fires and management practices including livestock grazing and timber harvest, vehicle strikes, climate change, recreation, and disease.

Rationale for great gray owl

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S1

Other Designations: CA-SE; FS-SS; CA-SGCN

The great gray owl has a global rank of G5 (Secure), a California State rank of S1 (Critically Imperiled), is recognized as a California Species of Greatest Conservation Concern, and is listed as Endangered under the California Endangered Species Act. The great gray owl is a Region 5 Forest Service Sensitive species. Although no yet officially recognized, a new subspecies has been proposed in the Sierra Nevada based on data that demonstrates genetic distance from other geographic populations; the proposed subspecies is known as *Strix nebulosa yosemitensis* (Hull et al. 2014*)*. Great gray owls outside the Sierra Nevada and in California are most likely *Strix nebulosa nebulosa*.

Wu and others (2016) recently estimated a population of about 160 breeding adults in California. While trends are unknown, declines in the Sierra Nevada are suspected based on threats including habitat loss or degradation, and the potential for inbreeding given such a small population size (Hull et al. 2010).

Great gray owls nest in conifer dominated habitats including montane hardwood conifer at lower elevations to Sierran mixed-conifer, white fir, red fir, and lodgepole pine at higher elevations (Wu et al. 2016). Breeding sites are frequently closely associated with meadows (Winter 1986, Greene 1995, Sears 2006, van Riper and Wagtendonk 2006, Keane 2011), but some have been located up to 750 m (2,460 ft) from the nearest meadow (Wu et al. 2015). They prefer dense canopy cover (> 80%) (Greene 1995, Wu et al. 2015) and high densities of large snags (Sears 2006, Wu et al. 2015). Great gray owls generally winter at lower elevations and use a variety of habitats including grassland, meadow, riparian areas, hardwood conifer and conifer forested habitats (van Riper and Wagtendonk 2006, Jepsen et al. 2011). They forage almost exclusively on pocket gophers and voles, but take other prey in lesser quantities such as deer mice, moles, shrews, beetles, squirrels, chipmunks, and alligator lizards (Winter 1986, Bull et al. 1989).

Threats to persistence of great gray owls include small population size, meadow and adjacent forested habitat degradation or loss from fires and management practices (e.g., livestock grazing and timber harvest), vehicle strikes, climate change, and disease. In Yosemite National Park human disturbance

related to campgrounds and their development has been documented (Maurer 2006, Bull and Duncan 1993). The great gray owl population in California is at risk because it is very small (Hull et al. 2010). Small populations are more susceptible to inbreeding, population bottleneck, and founder effects. For example, in small populations, retention of maladaptive genes or the loss of adaptive genes could lead to reduced genetic diversity (Shaffer 1981, Lande 1993). Small populations are less able to recover from losses due to environmental stochastic events such as large wildfires (Wu et al. 2016).

Habitat degradation from inappropriate livestock grazing and timber harvest can be significant threats to great gray owl persistence (Wu et al. 2016). Livestock grazing can result in the removal of vegetative cover required by critical prey species (Beck and Winter 2000). Other secondary effects of grazing include lower water tables, lower meadow vegetative diversity, and increased soil compaction or erosion (Fleischner 1994, Belskey et al. 1999) which degrade habitat for prey species (Torre 2007, Rickart 2013).

Prey habitat relationships in regard to the height of herbaceous vegetation are largely unknown for the Sierra Nevada; there are several pocket gopher species and two vole species known to occur in the Sierra Nevada (Moritz et al. 2008). Voles and pocket gophers generally have different preferences for the height of herbaceous vegetation and tend to utilize slightly different areas of meadows. Pocket gophers prefer drier portions of meadows while voles tend to prefer moister portions, resulting in a complex abundance and distribution between the species that is unique to each meadow. The relationship between herbaceous height, species abundance, and vulnerability to predation by great gray owls is not well understood for the various species. Deleterious effects to one prey species may be beneficial to another prey species. Voles are negatively correlated with grazing intensity (Winter 1986, Johnson and Horn 2008, Rickart 2013, Kalinowski et al. 2014), whereas gopher density may increase or decrease with grazing (Dull 1999, Powers et al. 2011). Recommendations for some prey species include maintaining sward height of at least 20cm (8 in) (Kalinowski et al. 2014) or maintain herbaceous vegetation at a height of 300mm (12 in) (Beck 1985, Greene 1995). Proper range management would reduce impacts on prey species habitat. Limiting, restricting, or resting meadows from grazing activity if they are not functioning properly is also recommended (Beck 1985, Beck and Winter 2000).

Great gray owls can be threatened by vegetation treatments that create an open canopy cover condition, removes nest structures, or disturbs breeding owls. Within suitable breeding habitat, timber harvest prescriptions that include retention of large live conifers, all large oaks, and retains snags at the rate of four per acre greater than 40 inches DBH (if possible, or greater than 24 in), and maintenance of at least 65% canopy cover, are considered compatible with great gray owl habitat requirements (Wu et al. 2016). Wu and others (2016) also recommend maintaining a limited operating period prohibiting road construction and vegetation treatments from February 15 through August 5 to protect breeding birds unless surveys indicate non-nesting status.

Additional threats to the persistence of great gray owls include vehicle strikes, which are considered a significant source of direct mortality because of the owl's use of low perches when hunting (Wu et al. 2016). Reduced speed limits or increasing the height of roadside fence lines and posts is recommended. While the effects of fire on great gray owls is not fully understood, loss and degradation of breeding habitat, as described above, are a considered a threat (Wu et al. 2016). Prescribed fire operations and suppression efforts should include protection of large trees (live and dead) as well as any known nest sites in occupied or suitable habitat areas (Wu et al. 2016). Great gray owls are considered vulnerable to climate change (Siegel et al. 2014b), since it may result in reduced snowpack and moisture in meadow habitat (Hayhoe et al. 2004, Godsey et al. 2014). Disease, poisoning, predation, and human disturbance are also considered threats to great gray owls; however, limited information exists on effects of and appropriate mitigations to these threats.

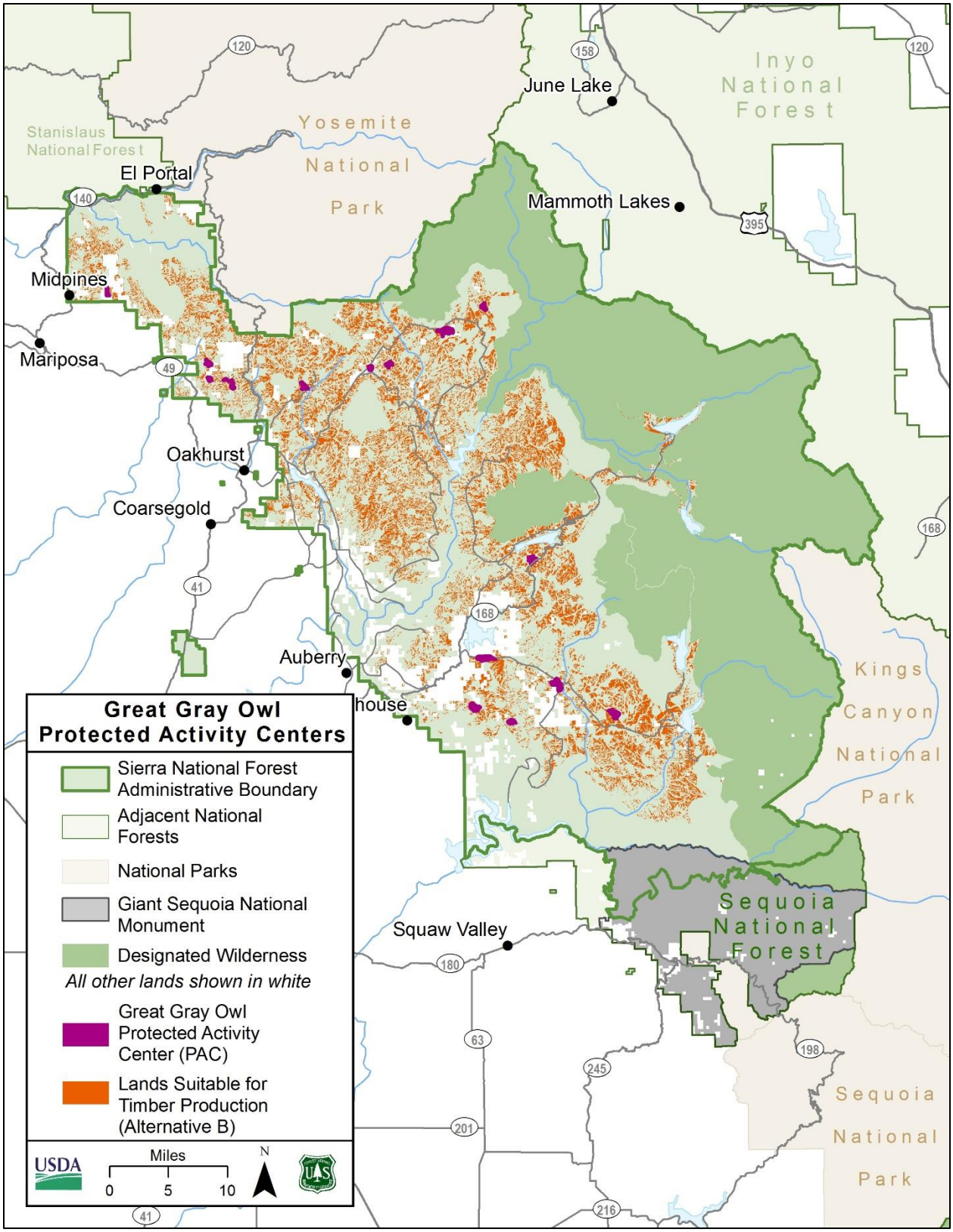

Figure 2. Great gray owl protected activity centers on the Sierra National Forest

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

There are 361 records of Great gray owl on the Sierra NF in the NRIS database. Although the majority of sightings are concentrated on the western side of the forest, running north to south, there are several located along the eastern side of the forest, with many in wilderness areas. There are 14 protected activity centers on the Sierra National Forest (Figure 2).

Key ecological conditions for this species (see above for additional details)

Great gray owl are most commonly found near montane meadows surrounded by dense forest of medium to large mixed conifer and red fir tree species, and with early seral stage habitat that support abundant prey. It is strongly associated with relatively large meadows (10 acres or groupings of meadows within 500 meters of each other that add up to 10 or more acres). However, more recent surveys have found multiple nests at lower elevations in mixed hardwood-conifer forests, sometimes miles from the nearest montane meadow. Wu et al. (2015) found that 21% of the nest sites they visited were below elevations of 3,000 feet and over 0.4 mile from the nearest meadow. Almost one third of the nests were in oaks, rather than the typical broken-top fir snag.

On the Sierra NF, ecological conditions supporting great gray owl can be found in the mixed conifer forest-dominated montane zone and upper montane forests. These zones include large areas of varied mixtures of ponderosa pine or Jeffrey pine, black oak, sugar pine, incense cedar, white and red firs interspersed with meadows, rocky outcrops and lodge pole pine. Potentially available habitat as classified by the CWHR (acreages in parentheses) includes the following vegetation types: Jeffrey Pine (28,585), Lodgepole Pine (32,168), Montane Hardwood-Conifer (77,455), Ponderosa Pine (73,574),Red fir (141,303), Sierran Mixed Conifer (269,921), Subalpine Conifer (179,348), Wet Meadow (19,355), and White fir (2,556).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

On the Sierra NF, the number of large meadows has not changed significantly in the last decade with the exception of a few stand replacing fires that have removed potential nest stands adjacent to a large meadow or meadow complex habitat. In the previous 10 years, this has occurred in two instances on the Sierra NF when the Big Creek Fire removed the nest stand adjacent to Mushroom Rock and the Snake/Cargyle2 Fire in the wilderness removed a potential nest stand next to Cargyle meadow. More recently, the 2015 Willow fire burned around Peckinpah Meadow which is considered GGO habitat, however recent surveys in 2012-2013 did not detect the species around that meadow. The fire may have created more foraging habitat because much of it was in the same footprint of the 2001 North Fork fire, where a Great gray owl was detected in the winter foraging near a road in the fire area in January 2005 (USDA 2017).

The total area of meadows in the Sierra Nevada has decreased due to past and current land use practices such as dams, diversions, and recreation; upland vegetation encroachment from conifers and sagebrush as a result of fire suppression; or from drying due to stream channel incision (Gross and Coppoletta 2013). Over 90 percent of the meadow sites sampled on the Sierra NF indicate high protective ground cover (less than 10 percent bare soil) which should provide good cover and forage for small mammalian prey.

The extent of conifer encroachment on the Sierra NF was studied using a protocol developed by MacDonald and Kuitu (2009). The final sample size was 54 meadows in the Dinkey/Tamarack planning area and 65 meadows in the Globe (Beasore) planning area. Ninety percent of the meadows were between

6,000 and 9,000 feet. The mean size of these meadows was about seven acres. Meadow size tended to be larger at the highest and lowest elevations, compared to the mid-elevation range of 6,000-9,000 feet, and there was no clear difference in mean meadow size between the two study areas. The overall mean encroachment class for the 119 meadows was 2.6, suggesting relatively little encroachment. Twenty-four or 20 percent of the meadows evaluated indicated an increase in size or negative encroachment. The qualitative assessments made for each meadow suggest that this increase in meadow area is most likely a result of logging. Mean encroachment class tended to increase slightly with increasing elevation, and the highest mean encroachment class was for meadows from 7,000-10,000 feet.

Large trees and snags

Overall, the number of large trees and snags are low and highly variable across all forest types. In all conifer types, there is less than 5 large trees (less than 30 inch diameter) per acre. In addition, the densities vary radically across the landscape as large trees are not evenly distributed. Most areas have a few large trees per acre and some patches, often previously disturbed (timber harvest or wildfire), don't have any and where they occur, they can be in clumps and patches across the landscape. Very large trees, trees more than 40 inch diameter, densities are even lower, typically less than one to two trees per acre. Again, many areas have no very large trees, and a few have some. In hardwood conifer and hardwood types, large tree levels are also somewhat low, with trees less than 24 inch diameter in the range of 4 to 6 per acre in conifer-hardwood forests.

The projected status of those ecological conditions relative to the species considered

While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sierra NF, substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of the Sierra NF assessment, indicating they are susceptible to higher amounts of crown fire than expected. Overall, continuous vegetation cover is present but within-patch diversity is greatly reduced from estimated historic conditions. This is largely due to fire suppression and past forest management, which has also resulted in high forest and vegetation densities, and very high surface fuel loads. These conditions, in combination with current and future warming and drying climate trends increase vulnerability to high intensity fires and further fragmentation of old forest habitat.

In general, large scale uncharacteristically severe wildfire are expected to increase in frequency and intensity, poses a risk to Great gray owl habitat. Bark beetle outbreaks are expected to further exacerbate already dry conditions and increase fire risk.

The following estimates show projected trend (2012-2032) for each forest type potentially used by Great gray owl. Approximate percentage of each habitat type on the Sierra NF are in parentheses.

> *Coniferous Forest, Early Seral (3.4):* Decreasing trend most likely due to fire suppression, salvage logging, and natural succession shifting forests into mid-seral condition.
>
> *Coniferous Forest, Complex Early Seral (Unknown):* Decreasing trend due to past fire suppression, salvage logging, reforestation (by humans), and mechanical thinning.
>
> *Coniferous Forest, Mid Seral (19.9):* Gradual decreasing trend. Major loses are projected if large scale, high intensity fires occur in these forests due to high fuel loads.
>
> *Coniferous Forest, Late Seral, Closed Canopy (11.5):* Gradual increasing trend as the large amounts of mid-seral stands progress into late-seral forests. The continued management framework would retain nearly all trees >30 inches dbh, thus increasing the number of stems per acre.

Coniferous Forest, Late Seral, Open Canopy (0.2): This small amount of habitat is predicted to remain stable although possibly increasing as a result of closed canopy forests shifting into open canopy forests as a result of potentially increased mortality.

Wet Meadow (1.4): Decreasing trend expected if: 1) pace and scale of meadow restoration does not increase, such as by reducing tree encroachment, removing roads and trails from meadows that cause a change in hydrology, eliminating grazing impacts that result in drying of meadow systems and cause a change in hydrology; and 2) continued climate changes resulting in less water availability.

Overall, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function and composition (Meyer 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Forest Management

Past suppression policies have led to conditions that can result in large areas of high severity fire that may be detrimental to old forest species. Fire suppression and uncharacteristic wildfire can alter the structure and composition of the forest interface near meadows. Decreasing trends in early seral and complex early seral habitat (which can provide foraging opportunities) are most likely due to past fire suppression and salvage logging efforts. (see above for additional information). These past management practices can put forest edge habitat adjacent to meadows at particular risk.

Livestock grazing

Improper livestock grazing can affect the key ecological conditions of meadows and riparian areas by changing vegetation height over the summer and by affecting riparian vegetation. Current trends in the number of livestock grazing show a decrease in livestock numbers since the 1960s as summarized in Chapter 8–Range of the Sierra NF assessment. Lingering effects of past meadow impacts remain, especially where water tables have lowered. Some meadows have had active restoration projects.

Climate change

According to the DEIS, Great gray owl has a moderate to high climate vulnerability rating. Many models project significant range contractions in some species distributions, those with high climate sensitivity and low adaptive capacity. For example, alpine plants and animals that live at the highest elevations will have few if any other places to go to stay in the colder environments they are adapted to. Species with low adaptive capacity include those that have small and isolated populations, low genetic variation, and limited ability to move widely and low reproductive rates. Gardali et al. (2012) notes that Great-gray owl are among the bird species considered vulnerable to climate change in California.. Future changes in climate (i.e. increasing temperatures) combined with a change from a snow-dominated to a rain-dominated system will impact meadows due to changes in the hydrologic regime. Total meadow area may decline and wet meadows may shift to dry meadows, especially small irregularly shaped meadows at low to mid elevations (Gross and Copoletta 2013). This drying would decrease herbaceous biomass (which could in turn affect healthy rodent populations for the owl).

Climate vulnerability ratings (in parentheses) of the major vegetation types which could be used by Great gray owl include the following: Subalpine forest and alpine (High), Red fir forest (High), Wet meadow (High), Riparian Moderate (High) and Mixed conifer and yellow pine forest Moderate (High).

Disturbance

Recreation and activity related disturbance can cause nest failure during the breeding season. Primary roads can also cause direct mortality. There is no road that crosses the mountains on the Sierra NF, however, State Highway 41 and State Highway 140 access the northern half of the forest and State Highway 168 access the southern portion. The forest has approximately 180 miles of double lane paved roads which are considered main line arterials. The forest also has two Forest Service designated national scenic byways (NSB). The Sierra Vista NSB is on the Bass Lake Ranger District and is entirely on NFS roads. The Sierra Heritage NSB is on the High Sierra Ranger District and is entirely on city streets and a state highway. Incidental mortalities can occur. Population growth in many of the counties is expected to increase demand for recreation opportunities on the Sierra NF and may increase user conflict. According to 2010 census data, over one million people live within one hour of the Sierra NF. Population of the cities and towns near the forest are increasing. Based on 2000 and 2010 census data, the population within one hour of the forest increased 33 percent. City and towns within one hour of the forest increased 28 percent in Fresno County, 58 percent in Madera County, and 89 percent in Mariposa County.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

There are abundant observations of great gray owl on the Sierra NF, however, protected activity centers where breeding has occurred are limited to 14 PACs. The biggest threats to this species on the Sierra NF are widespread loss of habitat from uncharacteristic stand replacing fire and anticipated loss of meadow habitat resulting from climate change. These factors combined with range wide small population numbers (estimated at only 100-200 individuals in CA and as few as 14 breeding individuals) puts great gray owl at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, great gray owl meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Northern goshawk - *Accipiter gentilis atricapillus*

Type of Animal: Bird

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern:

Yes

Relevant threats to species:

Habitat loss from high severity fire, drought and bark beetle related tree mortality, and management activities such as timber harvest, thinning, and controlled burning. Climate change also poses a serious threat due to the predicted increase in fires. Forest management, such as controlled fire and thinning, may improve or degrade habitat depending on execution, especially as they affect the density of large trees and canopy closure. Potential threats to habitat caused by various silviculture treatments include forest fragmentation, creation of even-aged and monotypic stands, potential increases in area of younger age classes, and loss of tree species diversity.

Rationale for northern goshawk:

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S3

Other Designations: FS-SS; CA-SSC; CA-SGCN; BLM-SS

The northern goshawk has a global ranking of G5, indicating that the species is "secure: common, widespread and abundant" at the global scale, and has a rating of S3 in California indicating that it is "vulnerable" in California, and a rating of S2 in Nevada, indicating that it is "imperiled" in Nevada (NatureServe 2015c). The northern goshawk is a California bird species of special concern and a California bird species of greatest conservation need. It is also listed as a California BLM Sensitive species.

The goshawk is a Holarctic species (found throughout all the northern continents of the world), and the North American subspecies (*Accipiter gentilis atricapillus*) breeds throughout Alaska, Canada, and mountains of the western United States and Mexico, and winters sporadically to the central-eastern United States and northern Mexico (Squires and Reynolds 1997b, American Ornithologists' Union 1998). The range is relatively contiguous throughout North America. Six other subspecies occur in Eurasia (Squires and Reynolds 1997b). In California, northern goshawk breeds locally in coniferous and mixed-coniferous forest in northwestern California (Del Norte and Humboldt counties) and across both sides of the Sierra Nevada range, south to Tulare and Mono counties, generally at elevations of 1400-3000 m (4,600-10,000 ft) (Bloom et al. 1985).

Northern goshawks are considered locally uncommon as a breeding and wintering species in California (Bloom et al. 1985, Gaines 1992, Small 1994, Woodbridge and Detrich 1994, Bezener and Fix 2000, Keane 2008). Breeding densities in the Cascades of northern California are tied to sparsely distributed

forest patches (Woodbridge and Detrich 1994). Population size of northern goshawk based on Breeding Bird Survey data from 1998-2007 is estimated at 7,000 individuals in California and 1,300 in the Sierra Nevada (Partners in Flight 2013, eBird 2016). Based on records from eBird and CNDDB, northern goshawks are only absent from two national forests (NF) in California, the Angeles NF and Cleveland NF (CNDDB 2016, eBird 2016). Breeding Bird Survey data throughout North America indicate essentially stable populations during 1966-2013 (-0.15% per year with non-significant and high variance around the mean) and 2003-2013 (+0.69% per year) (Sauer et al. 2014). Northern goshawk in California had a stable trend during 1966-2013 (+0.80% per year) and from 2003-2013 (-1.08% per year) (Sauer et al. 2014). According to Christmas Bird Count (CBC) data for all of North America from 1966-2013, trends were negative (-0.5% per year, 95% CI: -3.7-0.4) (Soykan et al. 2016). However, the Breeding Bird Survey and Christmas Bird Count are largely recognized as inadequate for monitoring population trends of goshawks (Keane 2008).

Northern goshawk is an irruptive migratory species, with breeding and winter distributions throughout North America. Many individuals may be resident in years when food resources are sufficient (Doyle and Smith 1994). Natal dispersal distances may also be driven in part by food availability (Kennedy and Ward 2003). Migration routes and winter range are not well known for this somewhat secretive species, but some banded individuals have been recovered up to 2,500 km (1,550 mi) from banding locations (Squires and Reynolds 1997a). The species is known to undergo both southward and down-slope migration in California (Bloom et al. 1985, Gaines 1992, Small 1994, Keane 2008). In the Sierra Nevada, goshawks are generally year-round residents that expand home range size during the winter (Keane 1999). There is no evidence to suggest barriers to dispersal.

Northern goshawks tend to nest in forested habitat across their range, across all elevations, leading some to characterize them as habitat generalists at the landscape scale (Squires and Reynolds 1997a). Within their breeding home ranges they tend to select mature to old-growth forest stands, or forested areas that have large diameter trees and dense canopy (Greenwald et al. 2005). The finest scale of habitat selection and the best described is nest area, typically encompassing the area including the main nest tree and alternate nests (Squires and Kennedy 2006). Northern goshawks nest in areas with larger diameter trees, higher canopy closure, with an open understory (Squires and Ruggiero 1996, Squires and Reynolds 1997a). During winter and migration, goshawks occur sporadically in other habitats including hardwood forests, but variability of habitat selection along the apparent lack of winter site fidelity results in less conservation concern than would be the case for habitat specialists (Garrett and Dunn 1981).

In California, goshawks typically nest in areas of high canopy cover, with large trees and old forest characteristics. However, results from goshawk nest site studies have shown geographic differences in canopy cover. In northern California, canopy closure at nests ranged from 53–92% (Saunders 1982). In eastern California, Hargis et al. (1994) found that although goshawk home range locations and nest areas have greater canopy cover, greater basal area, and more trees/ha than a random sample from the study area, goshawks nest in stands that are more open (31%) than found in northwestern or northern California. Suitable stands occur in a broad range of conifer and conifer-hardwood types, including ponderosa, Jeffrey, and lodgepole pine, mixed conifer, white and red fir, Douglas-fir, and mixed redwood–Douglas-fir–hardwood; less common in quaking aspen and in pinyon-juniper (Gaines 1992). Nest stands are often on moderate slopes or benches, and have open understories.

Goshawk response to wildfire is believed to differ substantially by region and historical fire regime. While high intensity wildfire appears to have a negative influence, lower intensity burning could be beneficial to goshawks by reducing colonization of understory by shade tolerant trees, and maintaining the open understory conditions that northern goshawks prefer (Squires and Kennedy 2006).

Upper montane forests utilized by northern goshawks have likely been less altered by forestry practices, fire management, and exurban development than lower-elevation forests, at least in most parts of the California range (Katibah 1984, Siegel and DeSante 1999, California Partners in Flight 2000, Robinson and Alexander 2002, Riparian Habitat Joint Venture 2004, Bunn et al. 2007b). Fire suppression during the first part of the 20th century (Kilgore 1973) probably has had both positive and negative effects on northern goshawks; historical timber-harvesting practices, especially clear-cutting, likely has had negative impacts on this species; while fuel-reduction by both mechanical means and by burning may be beneficial in the long run (Kotliar et al. 2002, Keane 2008).

In the southern Sierra Nevada, the suitable nesting habitat within closed canopy forests has recently been substantially impacted from large high-severity fires and landscape scale tree mortality related to drought and bark beetle outbreaks. Habitat occupancy rates for northern goshawk are known to decrease in areas of tree cover loss. For example, in the Rim Fire on the Stanislaus National Forest, the amount of high severity fire within a territory negatively affected occupancy and nesting of goshawk and prevalence declined overtime from 70% the year following fire to 54% three years post-fire (Kalinowski et al. 2017). These results indicate that high-severity fire and associated loss of tree cover reduces the quantity and quality of goshawk habitat and is a conservation concern in the increasingly fire-prone and bark beetle outbreak-prone forests of California (Kalinowski et al. 2017). Severe decreases in canopy cover resulting from extensive bark beetle tree mortality may have similar effects as severe tree mortality caused by fire on goshawk productivity.

Clear-cutting impacts on the coarse scale habitat conditions for goshawks is of particular concern in areas of mixed “checkerboard” land ownership (Keane 2008). It appears goshawks require a minimum threshold amount (e.g. 80 ha in the southern Cascades) of nesting habitat in mature forest condition to maintain occupancy (Woodbridge and Detrich 1994). Thus, alteration of goshawk habitat on private lands adjacent to National Forest may increase the importance of habitat condition on National Forest for continued goshawk occupancy. For example, in mixed ownership areas on the Stanislaus National Forest, occupancy monitoring suggests that at least two northern goshawk territories were abandoned immediately following harvest activities, despite the maintenance of nearby suitable nesting habitat on National Forest land. Additional studies are needed to better determine what goshawks do and where they go after timber harvest (Rodriquez et al. 2016).

Multiple scientists have studied the effects of vegetation management (e.g. timber harvest, fuels treatments, etc.) and wildfire on the amount, distribution and quality of habitat (Bloom et al. 1985, Keane and Morrison 1994, Kennedy 1997, Squires and Reynolds 1997a, Daw et al. 1998, Smallwood 1998). The common threats identified include past timber harvest that resulted in a loss of large diameter trees and or foraging opportunities, principally in the lower elevations. Key ecological requirements for northern goshawks are suitable nesting and foraging habitat that support adequate prey populations. Rather than fluctuating randomly, limiting factors for raptor populations, including the northern goshawk are nest sites, habitat, and prey availability. Increasingly, a major threat to goshawks is fire which has impacted mature forests at all elevations in recent decades and is exacerbated by climate change. Lack of fire, which leads to overstocking of forest stands, along with drought and high ozone levels that stress trees can facilitate high fire severity (Long et al. 2014). During timber harvests in northern Idaho, nesting areas that retained >39% of the 170-ha (420 acres) of forest surrounding a nest were more likely to have goshawks reoccupy the area the following year (Moser and Garton 2009).

Rodriguez et al. (2016) conducted a meta-analysis and their results suggest that although both timber harvest and a lack of large trees are associated with lower occupancy by nesting goshawks, pairs that nest near timber harvest or in small trees have indistinguishable nesting success from pairs nesting in large

trees or farther from timber harvest. However, if goshawk pairs do nest at timber-harvest sites, their reproduction appears unaffected by this harvest. In agreement with other reviews (Squires and Kennedy 2006), Rodriguez et al. (2016) describe that regardless of forest type, goshawks prefer dense patches of more mature trees, relative to availability, for situating nests. Rodriguez et al. (2016) found only a lack of evidence that stand characteristics and timber harvest influence the success of nesting attempts that occur in the presence of timber harvest. When evaluating the size of buffers to timber harvest in regards to nesting success, Rodriguez et al. (2016) states that it remains mostly untested whether larger buffers might ameliorate negative effects of timber harvest on goshawk occupancy. Overall, the studies that compared goshawk nesting success to tree size or timber harvest were based on small samples which led to large confidence intervals around the average effect size reflecting low precision of the estimate (Rodriguez et al. 2016).

It is unclear how goshawk populations will respond to climate change. One potential threat from climate change is an increasing rate of fire in higher elevation forest stands (Schwartz et al. 2015), areas that contain old-growth forest that have largely been spared from harvest. However, the effects of fire in these stands is largely dependent on fire severity, as lower fire severity can maintain or benefit goshawk habitat. Based on the climate change vulnerability (CCV) index, a risk assessment tool developed by NatureServe to predict a species vulnerability to climate change, northern goshawk in the Sierra Nevada was rated as moderately vulnerable, which is defined as "abundance and/or range extent within geographical area assessed likely to decrease by 2050" (Siegel et al. 2014c). Across their range, northern goshawks display population-specific demographic relationships with local weather and regional climates. Based solely on projections of climate change, this population-specific variation is anticipated to result in population-specific responses to future climate scenarios, which could range from little effect to potentially significant effects (Araújo et al. 2005, Long et al. 2014). For example, in Europe goshawks have responded positively to increasing temperatures that have enabled earlier breeding and larger clutches (Lehikoinen et al. 2013). The impact that climate change may have on goshawk nesting and foraging habitat and prey populations in the future is unclear. It is also unclear what if any effect climate change would have on goshawk populations, as these changes would likely very depending on population-specific conditions.

A study conducted by Morrison et al. (2011) in the Lake Tahoe Basin indicated that northern goshawks are susceptible to human disturbance; human activity was twice as high in infrequently occupied territories as compared to frequently occupied territories. Many kinds of human activities have been documented to affect raptors by altering habitats, physically harming or killing eggs, harming young, killing or stressing adults, or by disrupting normal behavior (Postovit and Postovit 1987, Delany et al. 1999 as cited in Morrison et al. 2011). A recent study on nesting northern goshawk response to logging truck noise found that while goshawks alerted (turned their head in the direction of the noise) to the noise they did not flush and response was inversely proportional to the distance of the nest from the road (Grubb et al. 2012).

In summary, northern goshawks are considered locally uncommon as a breeding and wintering species in California, but are relatively well-distributed and present in most forested areas across their core breeding range. Populations are considered to have remained stable over the past 50 years. Goshawks use a broad range of vegetation types, and habitat on national Forests in California is widespread and well distributed. Goshawks possess excellent dispersal capabilities, and there are no identified barriers to dispersal. Potential threats to goshawk include habitat loss from wildfire and climate change. Effects from wildfire vary greatly, depending on fire severity. Goshawk populations may be influenced by climate change in the future, however, there is significant uncertainty about how goshawk populations might respond to changing habitat conditions.

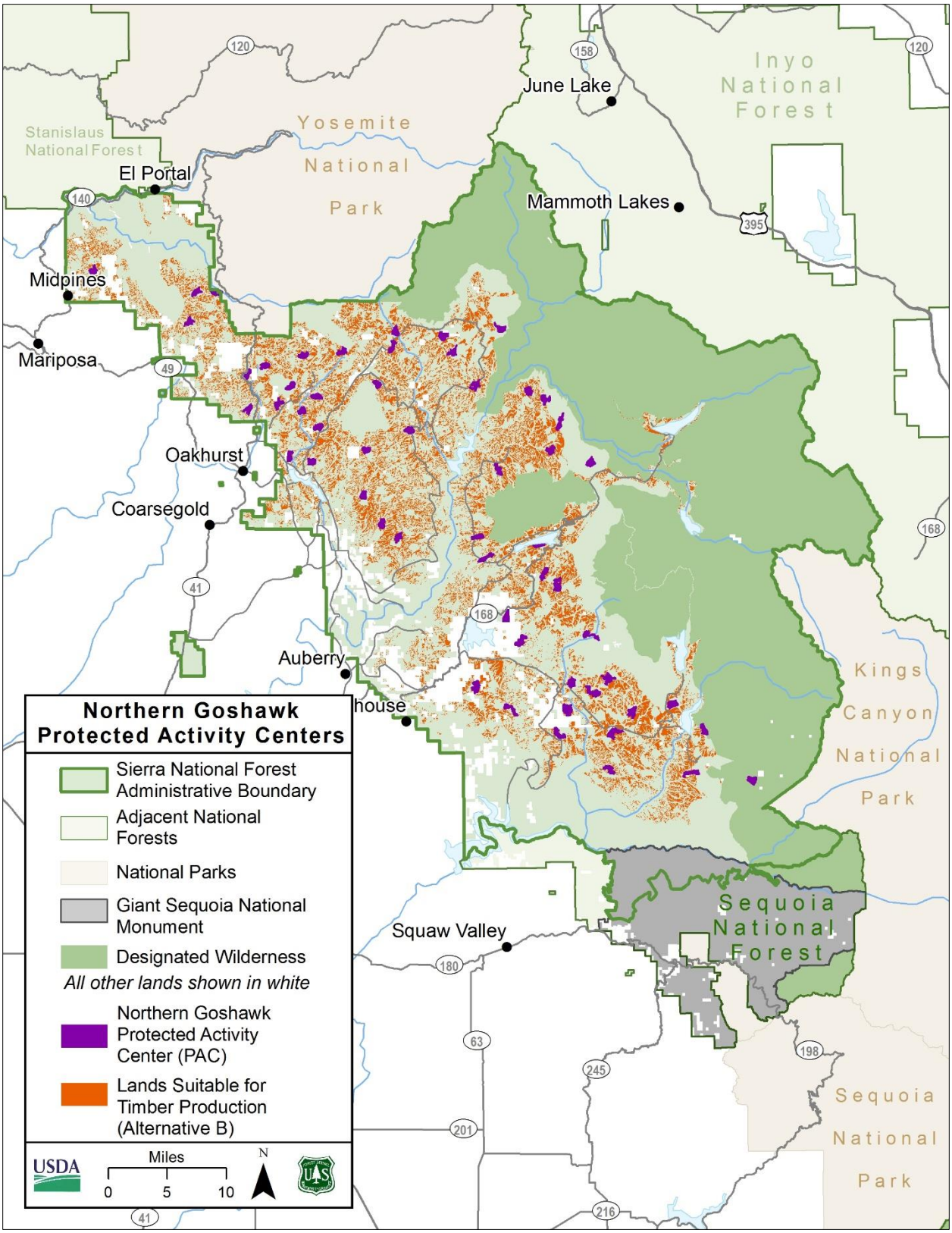

Figure 3. Northern goshawk protected activity centers (PAC) on the Sierra National Forest.

Forest-specific Rationale:

Information on current distribution of the species on the planning unit

There are 591 northern goshawk records with 824 individuals in the NRIS database within the forest boundary, and 630 records with 895 individuals within the forest and a 5 mile buffer. There are 50 eBird records and 53 total individuals for the Sierra National Forest, and 125 records with 143 individuals within the forest plus a 5-mile buffer. There are 4 CNDDB records within the forest and 15 within the forest and a 5 mile buffer. An early report of the distribution of birds in California (Grinnell and Miller 1944) include observations of northern goshawk in the Sierra Nevada, with 12 sightings on the Sierra National Forest.

Northern goshawk territories are managed on the Sierra NF as protected activity centers (PACs) as prescribed by the Sierra Nevada Forest Plan Amendment (USDA 2004). There are 66 PACs documented on the Sierra NF (2017 NRIS). The number of current active territories is not known. The PACs are 200 acres in size and are delineated based on all known and newly breeding territories detected on Forest. The goshawk territories, which are approximately 175 acres, are based on historical information so a current nest site maybe unknown. As areas are surveyed and nests are located the status may change from a territory to PAC delineation (USDA 2017).

Key ecological conditions for this species (See above for additional details)

Northern goshawk is found in dense mature mixed conifer to lodgepole pine and deciduous forests interspersed with meadows, other openings and riparian areas (2000-8000 ft). Goshawks are foraging generalists but have more specialized habitat requirements for breeding and prefer higher canopy closure and larger trees in the nest stand. Nests are frequently found near the lower portion of moderate slopes, close to water, and often adjacent to a canopy break (Squires and Reynolds 1997). Nesting in stands more dense than surrounding forests may reduce predation and, in combination with north slopes, may provide relatively mild and stable micro-climates (Reynolds et al. 1992).

Sierra National Forest vegetation types as defined by California Wildlife Habitat Relationship system indicate the following acreages on the Sierra NF as potential habitat for goshawk: Jeffrey Pine (28,585), Lodgepole Pine (32,168), Red fir (141,303), Sierran Mixed Conifer (269,921), Subalpine Conifer (179,348), Montane Riparian (3,823), Wet meadow (19,355), Montane-Hardwood-conifer (77,455), White fir (2,556) and Aspen (569).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Northern goshawk PACs encompass over 13,700 acres on the Sierra NF. The Bass Lake Ranger District has 28 PACs, and High Sierra Ranger District has 38. Using the draft 2016 existing vegetation layer for the forest, there were over 353,000 acres of goshawk high quality nesting (CWHR) habitat on the Forest, with over 154,000 acres of suitable habitat on the Bass Lake Ranger District

Before the recent tree mortality event, there was 65,590 acres of suitable goshawk high nesting habitat on the Sierra NF as defined by CWHR types MHC, PPN, SMC, WFR, MRI, JPN, LPN, SCN, MHW and 4M, 4D, 5M, 5D, and 6. Foraging habitat includes all those for nesting plus 5P and 5S. Moderate nesting habitat is ASP (6, 5D, 5M, 4D and 4M), RFR 4D and 4M, LPN and SCN 3D and 3M.

The following was determined during forest assessment for the Sierra National Forest (USDA 2013):

- the number of large trees and snags were low and highly variable across all forest types

- in all conifer types, there is less than 5 large trees (greater than 30 inch diameter) per acre
- densities vary radically across the landscape as large trees are not evenly distributed
- Most areas have a few large trees per acre and some patches, often previously disturbed (timber harvest or wildfire), have none or they are unevenly distributed across the landscape
- Very large tree (trees > 40" dbh) densities are typically less than one to two trees per acre, many areas are devoid of large trees
- In conifer-hardwood forests, large tree levels are also somewhat low, with trees < 24" dbh ranging from 4 to 6 per acre
- Large snags show similar patterns to large trees, but with lower densities and higher variation
    - Calculations of snags greater than 15 inches diameter show the range is from 1 to 4 snags per acre in conifer forests
    - As with large trees, the numbers are lower for conifer-hardwood, generally less than 3 snags per acre and numbers are calculated to be even lower in the oak woodland
    - Snags are especially variable in distribution with some patches containing large numbers from recent wildfires or where insects or disease killed groups of trees and other areas containing few dead trees
    - Large snags can stand for longer periods of time (decades) than smaller diameter snags (often less than a decade)

The Sierra National Forest has incurred recent landscape scale tree mortality related to drought and bark beetle outbreaks, including western pine beetle in ponderosa pine (Pile et al. 2018, Restaino et al. In press, United States Department of Agriculture 2017). Preliminary analysis of tree mortality from plot survey data in areas affected by drought, warmer temperatures, and bark beetle outbreaks indicate pine mortality on the Sierra National Forest of over sixty percent in surveyed areas (Meyer 2018). Areas at lower elevations, below 6,000 feet, were initially impacted followed by outbreaks of other bark beetle species affecting higher elevation tree species. The majority of the ponderosa pine belt has sustained heavy mortality. Bark beetles generally target trees greater than 10" DBH, and areas with moderate to heavy tree cover. Estimated mortality since 2014 is summarized in Table 3 and Table 4.

The 2017 aerial detection surveys for insect and disease conditions indicate mortality is becoming more evident at the higher elevations, primarily in white and red fir, as compared to previous years where most of the extensive mortality was observed in lower elevation pine and mixed conifer forests. Mortality in low elevation pine of the southern Sierra Nevada range is greatly reduced due to lack of viable host and more normal precipitation conditions. However, low elevation pine mortality elsewhere is common.

Table 3. Preliminary estimates of tree mortality on the Sierra NF

Year	Estimated Acres of Mortality	Estimated Number of Dead Trees
2014	54,651	190,358
2015	381,000	5,900,000
2016	557,000	18,563,000
2017*	297,000	6,836,000

Table 4. Acres of insect and disease related mortality by tree type on the Sierra National Forest.

Host	2012	2013	2014	2015	2016	2017
Mixed conifer	100	None	None	191,400	386,500	33,900
Ponderosa pine	10,100	8,300	10,400	114,400	110,700	22,300
California red fir	1,200	2,900	1,800	12,500	33,900	206,400
White fir	2,500	5,100	1,500	7,500	21,800	32,400
Fir	None	None	3,400	16,300	29,200	None
Major Pine Type*	None	None	None	16,200	19,000	300
Lodgepole pine	11,500	14,200	11,000	3,800	900	3,600
Jeffrey pine	900	1,200	12,100	7,000	4,200	5,900
Whitebark pine	100	300	3,500	100	100	4,100
Sugar pine	2,400	3,900	300	None	None	300

*Major pine type is composed of mix of ponderosa, Jeffrey, lodgepole, pinyon, or southwestern white pine.

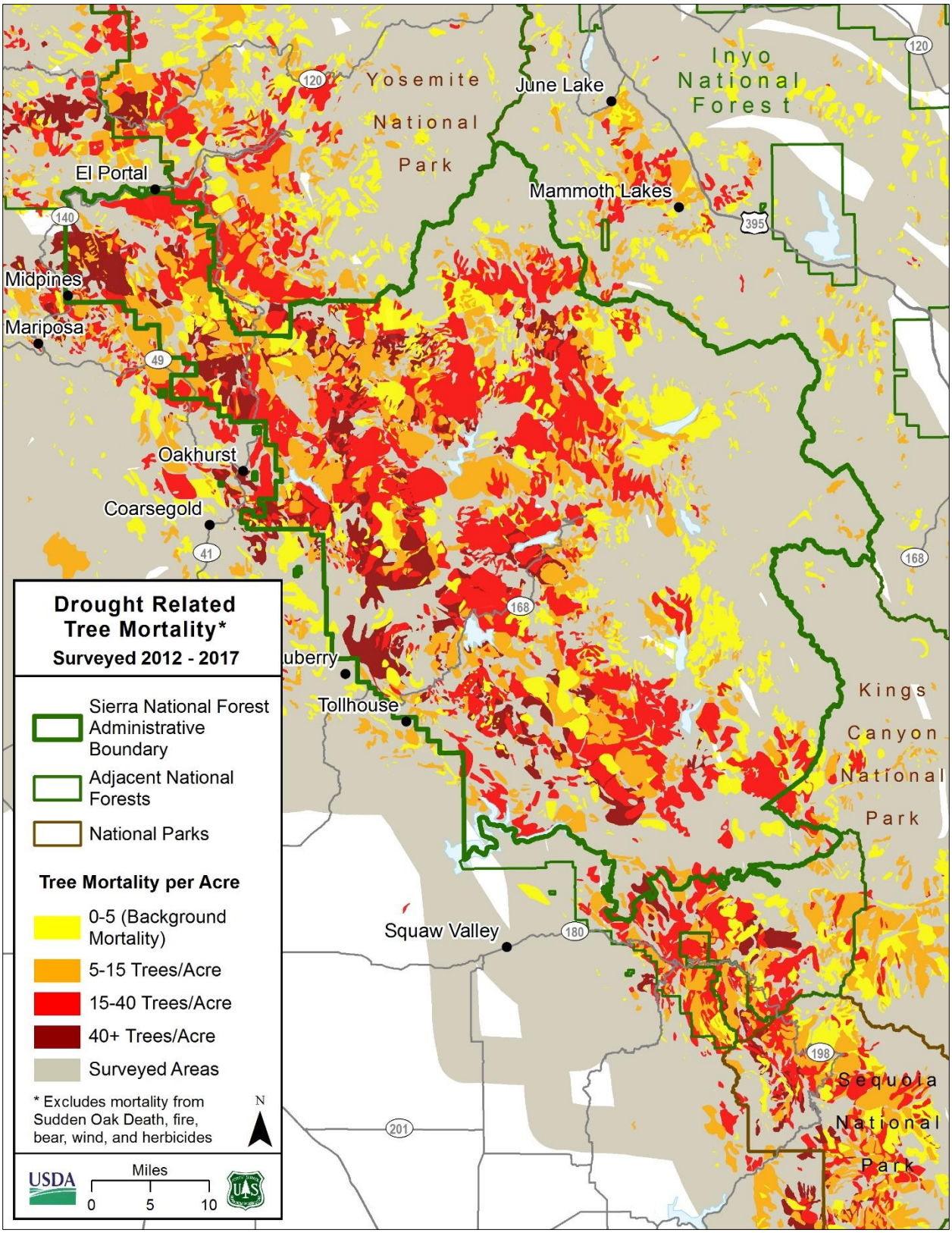

Figure 4. Drought and insect-related mortality through 2017 in the southern Sierra Nevada based on aerial detection surveys

The projected status of those ecological conditions relative to the species considered

During the next 10-20 years, the suitable habitat acreage for goshawks is expected to remain stable or continue to increase, under current management. This habitat acreage consistency is largely the result of past and current management, which has included fire suppression management. This current management also has emphasized retaining and increasing large tree habitat. This current and projected habitat stability over the next 20 years suggests northern goshawk population could also remain relatively stable or increase during that projected 20 year time frame. However, broad-scale habitat assessments also need to consider the finer details of habitat conditions and health, including threats to short- and long-term habitat sustainability (Chapter 5 Sierra-Identifying and Assessing At-Risk Species).

The following estimates show projected trend (2012-2032) for each forest type potentially used by Northern goshawk. Approximate percentage of each habitat type on the Sierra NF are in parentheses.

Oak-associated Hardwoods and Hardwood/Conifers (15.1): Declining trend, major change not expected however, large scale, high intensity fire in a warming climate can lead to shifts from conifer forests to hardwood dominated forests.

Coniferous Forest, Early Seral (3.4): Decreasing trend most likely due to fire suppression, salvage logging, and natural succession shifting forests into mid-seral condition.

Coniferous Forest, Complex Early Seral (Unknown): Decreasing trend due to past fire suppression, salvage logging, reforestation (by humans), and mechanical thinning.

Coniferous Forest, Mid Seral (19.9): Gradual decreasing trend. Major loses are projected if large scale, high intensity fires occur in these forests due to high fuel loads.

Coniferous Forest, Late Seral, Closed Canopy (11.5): Gradual increasing trend as the large amounts of mid-seral stands progress into late-seral forests. The continued management framework would retain nearly all trees >30 inches dbh, thus increasing the number of stems per acre.

Coniferous Forest, Late Seral, Open Canopy (0.2): This small amount of habitat is predicted to remain stable although possibly increasing as a result of closed canopy forests shifting into open canopy forests as a result of potentially increased mortality.

While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sierra NF, substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of the Sierra NF assessment, indicating they are susceptible to higher amounts of crown fire than expected. Overall, continuous vegetation cover is present but within-patch diversity is greatly reduced from estimated historic conditions. This is largely due to fire suppression and past forest management, which has also resulted in high forest and vegetation densities, and very high surface fuel loads. These conditions, in combination with current and future warming and drying climate trends increase vulnerability to high intensity fires and further fragmentation of old forest habitat.

Moisture stress and the frequency and severity of bark beetle outbreaks are projected to increase dramatically with increasing temperatures in the Sierra Nevada, resulting in widespread tree mortality (Bentz et al. 2010, Hicke et al. 2006). Bark beetle outbreaks began to occur over much of the Sierra and Sequoia National Forests in ponderosa pine, lower elevation mixed conifer forests, and then red fir forests. The amount of dying conifers is moderate to very high in many areas. These levels are greater than what has occurred in the last 50 years. In 2012, future projections had estimated that bark beetle and other forest insect activity will increase because of changes in climate such as elevated temperatures,

frequent drought, and current high risk conditions (dense vegetation) of Western forests (Bentz et al. 2010). Forest health monitoring risk maps (USDA FS 2012b) showed substantial risk of increased tree mortality (greater than 25 percent basal area lost) over a 15 year time period due to bark beetles and other pest complexes. Predictions that drought may become frequent and prolonged, that mortality will be proportional (Smith 2007), and warming and drying climate are expected to greatly increase the likelihood and risk of widespread and elevated insect and pathogen outbreaks (Fettig 2012) may have come to fruition, as this is currently happening on much of the Sierra and Sequoia National Forests. These levels are greater than what has occurred in the last 50 years.

Droughts may become frequent and prolonged, and it can be expected that mortality will be proportional (Smith 2007). Warming and drying climate are expected to greatly increase the likelihood and risk of widespread and elevated insect and pathogen outbreaks (Fettig 2012).

In summary, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function, and composition (Meyer 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Forest Management

Starting in the early 1900s, fires were actively suppressed with the intention of “protecting forests”. Logging in the mid-1900s focused on selective harvest of larger trees, and on regeneration of harvested areas in the 1980s (Verner et al. 1992, Helms and Tappeiner 1996). Years of fire suppression has resulted in increased vegetation density and uniformity, an increase of less fire tolerant trees, and understory fuel loads resulting in increased fire potential (van Wagtendonk 1985, Stephens and Moghaddas 2005, Stephens 2005, van Wagtendonk and Fites-Kaufman 2006, North et al. 2009).

Since the early 1990s, harvest of large trees was essentially eliminated, on the Sierra NF and the emphasis shifted to medium and now small diameter trees. Vegetation management around nests or den sites for the California spotted owl, goshawk, fisher, and marten was heavily restricted. At the same time, a growing concern for the cumulative effects of past management and fire suppression increased the focus on restoring fire and reducing forest densities and surface fuel accumulations. Currently, most of the landscape is not resilient to large, high intensity fire, and is susceptible to drought and insect/pathogen outbreaks. Restoration is proceeding at a pace and scale that is inadequate to address the problem.

Insect outbreaks and the resulting loss in canopy cover may be a limiting factor for goshawks at the nest stand. Dickson et al (2014) found canopy-base height (> 46 ft), canopy bulk density along with Northeast aspect to be the strongest positive predictor variables of goshawk occupancy at the territory scale in Arizona. High canopy bulk density may provide protection from predators at the nest and also habitat availability for several goshawk prey species. They found a strong negative relationship between occupancy and density. Using the same territory occurrence model Ray et al (2014) found that forest treatments comprised of thinning and prescribed fire in ponderosa pine forest were relatively minor compared to stand-replacing fire which had occurred in the same area. Their study demonstrated active

forest restoration is necessary in order to avoid the more pronounced and widespread degradation or loss of habitat.

Reynolds et al (2016) assessed the effects of mixed fire severity on goshawk productivity in the Warm Fire footprint, a 235 km2 fire that burned in 2006 in ponderosa pine and mixed-conifer forests. The focus of their study was to assess how low- and high-fire severity affected nest survival and productivity. They assessed post fire activity at 20 territories in areas of high and low fire severity and found that territories that lost more than 75% of the forest to moderate and high severity fire were not reoccupied, while territories that lost between 50-75% of the forest to moderate and high severity had only 43% reoccupation following the fire. Post-fire occupancy of a nest area in a burned territory depended on the availability of at least 1 alternate nest stand in the territory that had escaped high severity fire. Their study demonstrates management strategies for mixed fire.

It is reasonable to conclude severe decreases in canopy cover resulting from extensive bark beetle tree mortality may have similar effects as severe tree mortality caused by fire on goshawk productivity. However, there may be differences in timing. Newly bark beetle killed trees (snags) begin to deteriorate at rates that depend for the most part on tree species and size: small-diameter (<38 cm dbh) snags fall faster than large-diameter snags; and pines fall at faster rates than firs (Raphael and Morrison 1987). In general, dead trees typically lose all needles and twigs within five years and lose majority of larger limbs within five years.

In the short-term, trees killed by bark beetles turn into snags that remain on site and may provide short-term habitat (years 4-5); canopy cover is eventually reduced and nest sites will experience greater exposure. Prey species composition is expected to change in beetle-killed stands, including short-term changes in small mammal and bird densities; as tree mortality occurs woodpeckers and secondary cavity nesting birds are expected to increase providing alternative prey as small mammal populations decline. Reports in Utah (Graham et al. 1999) and Colorado (Skorkowsky 2007) suggest that goshawk productivity in the short-term was not affected by severe bark beetle caused overstory tree mortality; Graham et al. (1999) summarized there were no major differences in fledgling rates for goshawk nesting in lodgepole pine forest that had experienced up to 80% overstory mortality from bark beetles. Similarly, on the Dixie National Forest in southwestern Utah, nesting territories located in areas with high mortality caused by spruce bark beetle remained active (Dixie National Forest 1997). However, Graham et al. (1999) also suggested low use of ponderosa pine habitat in Utah was likely caused by the absence of large trees for nesting, due to past harvesting practices.

The rate of tree fall will increase over time (Raphael and Morrison 1987) and quality nest area habitat may decline. Individual trees, starting with pine, will begin to snap off at the top, or completely fall as roots decompose. Sites capable of supporting successful goshawk nesting may become limited and competition for suitable territories may increase between goshawks and other forest raptor species. Shade tolerant species in the understory that were not affected by bark beetles will begin to release. More recent research suggests widespread insect outbreaks and associated mortality may not provide the positive effects that occur as result of large fires, such as increases in understory regeneration and ecological release of shade intolerant species (Stephens et.al. 2018). This could have negative effects on goshawks small mammalian prey base.

Climate Change

Terrestrial ecosystems of the Sierra NF are expected to experience dramatic changes in climate in the coming decades (Meyer and Safford 2013, Safford et al. 2012). Consequently, the future range of variation in climate exposure for these ecosystems will almost certainly exceed the natural range of variation. Schwartz et al. (2013) evaluated future climate exposure to vegetation using downscaled

climate projections for the southern Sierra Nevada, including the Sierra and Sequoia National Forests. Their results indicate a high proportion of all terrestrial ecosystems used by northern goshawk will be moderately, highly, or extremely vulnerable to future climate by the end of the century (Refer to table 63 in the DEIS).

Effects from climate related change and variable precipitation brought on by El Nino and La Nina have the potential to negatively affect goshawk productivity. Reynolds et al (2017) recently analyzed a 20-year data set on goshawk demography on the Kaibab Plateau in Northern Arizona. They concluded that climate change-related drought effects on prey abundance coupled with the risk of habitat loss from stand replacing fire to be primary threats (Reynolds et al 2017). This study reinforces previous work by Salafsky et al. (2005) who found that while goshawks readily exploited a variety of different prey species, their overall productivity was greatly driven by differences in the densities of several key prey species. Similar factors may also be relevant to the Sierra NF goshawks and their prey base as climate change effects become more prevalent.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Population estimates for Northern goshawk on the Sierra National Forest suggest a stable to increasing trend due to the number of PAC locations, although the number of active goshawk territories on the Sierra NF is unknown. Recent population estimates for goshawk in California suggest a stable to increasing trend, but recent widespread bark beetle related tree mortality in the Sierra National Forest plan area put this species primary ecological conditions at risk. The recent large scale drought and bark beetle related tree mortality event poses a considerable risk to availability of the large live tree component. In addition, current and future warming and drying climate trends increase vulnerability to high intensity fires and further fragmentation of old forest habitat. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, Northern goshawk meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Willow Flycatcher - *Empidonax traillii* (includes: *Empidonax traillii brewsteri and Empidonax traillii adastus*)

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Nest predation and parasitism, and breeding habitat degradation and loss from management practices such as grazing, road construction, and water diversion.

Rationale for willow flycatcher

NatureServe Global Rank: G5

NatureServe T Rank: T3T4

State Rank: S1S2

Other Designations: CESA-Threatened; FS-SS; CA-SGCN; CA-SE; USFWS-BCC

The willow flycatcher (*Empidonax traillii*) has a global rank of G5, a California State rank of S1S2, is recognized as a species of greatest conservation concern, and is listed as endangered under the California Endangered Species Act. *E.t. adastus* has a global subspecies rank of T5 and *E.t. brewsteri* has a global subspecies rank of T3T4. The willow flycatcher is a Region 5 Forest Service sensitive species.

Generally, *E.t. brewsteri* breed in isolated patches in northern California and along the western slope of the Sierra Nevada and *E.t. adastus* breeds along the eastern slope of the Sierra Nevada and western Nevada. Since the boundary between *brewsteri* and *adastus* is indistinct, this rationale treats both subspecies simultaneously.

Green and others (2003) report population estimates for willow flycatchers in the Sierra Nevada range from 300-400 individuals with about 120-150 individuals occurring on National Forest System lands. While breeding bird surveys across the state of California indicate a non-significant increase in willow flycatcher numbers between 1966 and 2013, available data suggests a substantial decline has been reported for willow flycatchers in the Sierra Nevada over the past 40 years, resulting in the absence or near absence from many historically occupied areas.

Willow flycatcher migrants occur throughout California while breeding residents occur in the Sierra Nevada. Migrants occur in a variety of open habitat types and are not as dependent on the integrity of any

specific habitat or location. Breeding habitat consists of riparian stringers and meadow habitats at least 0.4 ha in size with saturated soils and dense shrubs (Green et al. 2013). Breeding birds are primarily associated with willow thickets 3-7 meters tall within or adjacent to meadows or forest clearings. They are less frequently found in riparian corridors dominated by other types of riparian shrubs. Most willow flycatcher nests are located in the lower branches of riparian shrubs, typically below 1.5 m (5 feet) (Fowler et al. *in* Green et al. 2003).

Loss and degradation of riparian and meadow habitat is considered the most significant threat to the persistence of willow flycatchers in the plan area. Degradation of habitat from management practices including livestock grazing (historic and present), road construction, and water diversion have resulted in a reduction (i.e., loss) of willow habitat, as well as compaction and drying of meadows. Drought and climate change are known to influence long-term patterns in meadow condition such as reductions in willow habitat; however, the recent declines in willow flycatcher population numbers and degradation of suitable breeding habitat have likely been accelerated due to anthropogenic factors (Green et al. 2003). Evidence of this is a large number of meadow sites that no longer support breeding willow flycatchers (Green et al. 2003). Habitat conditions on wintering grounds and along migration routes may be contributing to population declines; however, survival rates and return rates of individuals in the Sierra Nevada are similar or better than in other regions (Green et al. 2003). Restoration efforts that result in as little as a 10 percent increase in riparian shrub cover in meadows increases the likelihood of occupancy and nest success for willow flycatchers (Bombay 2003).

Livestock grazing has been documented to remove willow cover (Taylor 1986) and cattle occasionally knock down nests (Valentine et al. 1988). Livestock damage such as compaction and pedestalling can alter soil infiltration and water holding capacity in localized areas, resulting in drier meadows that either reduces or eliminates willows and therefore would not continue to support breeding willow flycatchers. While there is still debate over the correlation between livestock grazing and willow flycatcher status, there is evidence of past severe impacts to meadow habitat from livestock (Ratliff 1985).

Water diversions that result in a reduction of riparian vegetation, particularly willows, from either reduced water availability or inundation of riparian areas effectively degrade habitat quality for willow flycatchers. Recreation activities near breeding territories including hiking, camping, fishing, and off-road vehicle use can negatively affect flycatchers. Affects may include noise disturbance and increased risk of predation through the attraction of jays and squirrels, known predators, to food scraps and garbage that accompany public use. Roads near meadow and riparian habitat that alter the hydrologic function of these adjacent features can result in degrading habitat through dewatering or drying of meadows and riparian zones (Kattelmann 1996) and increased sedimentation that can have deleterious effects to aquatic invertebrate prey (Erman 1977 *in* Green et al. 2003).

The Willow Flycatcher Conservation Assessment (Green et al. 2003) identified roads as one of the leading contributing factors responsible for the loss and degradation of willow flycatcher habitat. Specifically, roads (dirt-surfaced or paved), intercept surface and subsurface hydrological flow. Meadow desiccation occurs when hydrological flows are intercepted and redirected which may result in long-term habitat loss or degradation. Roads may have a negative impact on meadow hydrology, especially when roads bisect meadows and have associated drainage structures to maintain road conditions.

Nest predation is common and is considered a likely factor most affecting population viability in the Sierra Nevada (Bombay 1999, Cain et al. 2003). Predators include milk snakes, common king snakes, red tailed hawks, weasels, chipmunks, and squirrels. Standing water around nests is considered a deterrent to mammalian predators and nests farther from trees exhibit higher nest success (Cain et al. 2003). Similarly, (Bombay et al. 2003) found that nests success increased with increasing distance from trees. Maintaining

standing water or saturated soils in meadow habitat would contribute to promoting willow thickets and preventing conifer encroachment, resulting in favorable breeding conditions for willow flycatchers.

Brood parasitism from brown-headed cowbirds is also identified as a threat to willow flycatchers. Brown-headed cow birds have a commensal relationship with domestic livestock. Rates of parasitism are variable and may affect flycatcher productivity at the local level (Green et al. 2003).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

On the Sierra National Forest, there are 117 records of 421 individuals of willow flycatcher in the NRIS database. The majority of those records are from the 1980s and 4 records are within the last 15 years. There are 20 records of 37 individuals in eBird and 8 records in CNDDB.

There were 8 known occupied flycatcher sites reported on the Forest in 2004 (USDA 2004). However, the Sierra National Forest has no currently occupied sites based on consistent survey and reporting for historically occupied sites. Flycatcher surveys are conducted using standardized protocol (Bombay et al. 2003). Two sites, Markwood Meadow and Long Meadow, were occupied, on two occasions each between 2000 and 2008, but these two sites have not been occupied since 2008. Follow-up visits for detections at other sites listed as occupied in the 2004 Framework have been negative, with no evidence of birds persisting through the breeding season.

Key ecological conditions for this species (see above for additional details)

Willow flycatcher is found in western Sierra Nevada's willow dominated riparian areas, including moist meadows with perennial streams and smaller spring-fed or boggy areas (2000-8000 ft.) Standing water is important.

There are an estimated 15,750 acres of meadow on the forest and 465,000 acres of riparian conservation areas (RCA) (USFS 2001 and 2004), associated with streams, meadows, springs and lakes. Meadows, seeps and springs in the drier southern Sierra Nevada provide important habitat diversity and habitat for plants and animals. Some meadows are considered to be in a degraded condition but not all are in poor condition.

Potentially available habitat as classified by the CWHR (acreages in parentheses) includes the following vegetation types: Montane Riparian (3,823), Valley Foothill Riparian 251, and Wet Meadow (19,355).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Over 90 percent of the meadow sites sampled on the Sierra NF indicate high protective ground cover (less than 10 percent bare soil).

The total area of meadows in the Sierra Nevada has decreased due to past and current land use practices such as dams, diversions, and recreation; upland vegetation encroachment from conifers and sagebrush as a result of fire suppression; or from drying due to stream channel incision (Gross and Coppoletta 2013).

Water quality and quantity are at present well within the natural range of variability in most areas of the forest. However, climate change is a stressor which may limit water quality and quantity in the future. Watersheds are overall in good condition, and most are able to recover from most perturbations imposed by human influence or are within the natural range of variability. A few are impaired due to water

withdrawals or impoundments. Invasive species, fire, and climate change remain stressors on watershed condition.

The projected status of those ecological conditions relative to the species considered

The following estimates show projected trend (2012-2032) for each forest type potentially used by willow flycatcher. Approximate percentage of each habitat type on the Sierra NF are in parentheses.

Wet Meadow (1.4): Decreasing trend expected if: 1) pace and scale of meadow restoration does not increase, such as by reducing tree encroachment, removing roads and trails from meadows that cause a change in hydrology, eliminating grazing impacts that result in drying of meadow systems and cause a change in hydrology; and 2) continued climate changes resulting in less water availability.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Meadow drying (roads, climate change, water diversions)

On the Sierra NF assessment, there is an estimated 1,969 miles of road across just over 1.3 million acres. The estimated sediment yield from these roads is between 0.01 and 0.09 tons per acre per year. Estimated road-related sediment yields overlap the low end of the range of reservoir sediment yields. This comparison indicates that roads are likely to be substantial sources of sediment in some actively-managed forested watersheds with overall low sediment yields.

Connectivity of aquatic habitat on the Sierra NF is altered by 50 dams and diversions which affect flow over approximately 220 miles of streams on the forest. Properly functioning watershed conditions create and sustain functional terrestrial, riparian, aquatic, and wetland habitats capable of supporting diverse populations of species. The forest completed a Watershed Condition Assessment (USDA Forest Service 2010). Twenty-five watersheds were properly functioning or good (43 percent of forest drainage), 33 watersheds were functional at risk (52 percent of forest drainage), and seven watersheds were defined as having impaired function (5 percent of forest drainage). Habitat fragmentation, flow alteration, exotic species, road density, and road proximity to water were the most common stressors affecting watersheds that were in less than good condition.

Future changes in climate (i.e. increasing temperatures) combined with a change from a snow-dominated to a rain-dominated system will impact meadows due to changes in the hydrologic regime. Total meadow area may decline and wet meadows may shift to dry meadows, especially small irregularly shaped meadows at low to mid elevations (Gross and Copoletta 2013). Climate vulnerability ratings for willow flycatcher habitat on the Sierra NF which include the wet meadow and riparian vegetation types are high and moderate-high.

Livestock grazing

Livestock grazing can affect the key ecological conditions of meadows and riparian areas by changing vegetation height over the summer, by affecting riparian vegetation, and drawing in invasive species such as brown headed cowbirds which can parasitize flycatcher nests. Current trends in the number of livestock grazing show a decrease in livestock numbers since the 1960s (USDA 2013). Lingering effects of past meadow impacts continue, especially where water tables have lowered. Some meadows have had active restoration projects. Overall permitted grazing use has declined on the forest. There is no overlap of occupied flycatcher sites and livestock grazing.

Hydrologic function of meadow habitats and other special aquatic features during range management analysis show predominately upward trends (Table 5).

Table 5. Summary of range management analysis regarding hydrologic function

Total Number of Assessments	Functional At-Risk Upward Trend	Functional At-Risk No Trend Apparent	Functional At-Risk Downward Trend	Non- Functional	Proper Functioning Condition
55	14	8	3	0	30

Fire suppression

Fire suppression, and other management that limited fire in riparian zones, has had a direct effect on the composition and structure of riparian vegetation. Fires naturally spread into riparian areas, although sometimes in different ways and frequency than into adjacent uplands. Lack of fire creates less patchiness, less diversity of plants and structure, and fewer associated animals. Increased conifer and overall vegetation density and uniformity in the riparian area result in higher-intensity fires across large areas, sometimes across entire watersheds or basins.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

In the past 15 years, there have been few detections for willow flycatcher on the Sierra NF and there are currently no occupied sites. Water use from expanding population pressure and human demands, coupled with increasing temperatures and temporal changes in precipitation and runoff events related to climate change will continue to put this species and its associated habitat components at risk in the future. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, willow flycatcher meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Mammals

Fringed myotis - *Myotis thysanodes*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Reduction in available roost sites through the removal of conifer and hardwood snags, loss of roost sites through improper closure of abandoned mines or caves.

Rationale for fringed myotis

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S3

Other Designations: FS-SS; CA-SGCN

The fringed myotis (*Myotis thysanodes*) has a global rank of G4 (Apparently Secure) and a California State rank of S3 (Vulnerable). The subspecies *Myotis thysanodes vespertinus*, which is believed to occur in Siskiyou, Shasta, Humboldt, and possibly Trinity Counties, has a subspecies rank of T2. The subspecies *Myotis thysanodes thysanodes*, which occupies the remainder of California does not have a subspecies rank. The fringed myotis bat is recognized as a Species of Greatest Conservation Need by CDFW. This species has been assigned a High Priority designation by the Western Bat Working Group (2016), indicating this species should be considered one of the highest priority for funding, planning, and conservation actions as it is considered imperiled or are at high risk of imperilment. The fringed-myotis is also a Region 5 Forest Service sensitive species.

Population size is unknown; however, they are thought to be widely distributed but rare everywhere they are found (CBWG 2016). While population trends are unknown, the limited data available suggests serious population declines (CBWG 2016). Many historically occupied sites are no longer occupied for a variety of reasons including human disturbance, modification of surrounding habitat, and exclusion from sites for health and safety reasons (CBWG 2016).

Fringed myotis are often found in oak woodland, pinyon juniper, mixed conifer forests, and mesic old growth forests in California (O'Farrell and Studier 1980, Weller and Zabel 2001). Fringed myotis roost colonially and are known to be highly sensitive to disturbance at roost sites (O'Farrrell and Studier 1973, O'Farrell and Studier 1980). They use a variety of roosting structures, but are most often associated with rock crevices, conifer snags, abandoned mines, caves and buildings (Baker 1962, O'Farrell and Studier 1980, Cryan 1997). In forests, they are reliant mainly on snag habitat for roosts. Snags documented to be used by fringed myotis for roosting in California are the tallest or second tallest pine or fir snag, have loose or sloughing bark, are > 58.5 cm dbh (23 inches), and are often in groups of 5 (Weller and Zabel

2001). They have also been documented to use giant sequoia basal hollows as maternity roosts in Yosemite's Merced Grove (Pierson et al. 2006). Fringed myotis forage along streams in fairly cluttered habitat as well as meadows.

Threats to the persistence of fringed myotis include reduction in availability or loss of roost sites. Removal or exclusion from anthropogenic roost sites such as buildings is most prevalent in urban areas and results from: restoration of historic structures, human disturbance, or extermination/exclusion for human health and safety reasons. Loss of roost sites in urban environments is not considered a limiting factor within the plan area.

Removal or loss of large snags and damaged trees ≥ 58 cm dbh (23 inches) during timber harvest or prescribed or wildland fire may result in a reduction of roost site availability on National Forest System lands (CBWG 2016). Like most forest dwelling bat species, fringed-myotis are documented to mainly use snags as roosting structures in forested habitat (Weller and Zabel 2001). Retention and recruitment of adequate snags in number, size, configuration, and decay class throughout the plan area is considered a potential limiting factor based on the ephemeral nature of these structures and the potential for loss during harvest operations and prescribed and wildland fires.

Recreational mining and closure of abandoned mine sites may have resulted in displacement of bats and reduction in roost site availability (Belwood and Waugh 1991). Several of the mine closures in the plan area have been accomplished by installing bat friendly gates that are designed to allow entry by bats but not humans. White-nose syndrome (a cold-loving fungus that afflicts bats hibernating in caves and mines) is a potential threat that has not yet been detected in California, but has recently been documented in Washington State (Sleeman 2016). Fringed myotis are not known to be affected by white-nose syndrome; however, they are known to use mines (O'Farrell and Studier 1980) and populations may be negatively impacted if this disease becomes established in the plan area.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

According to the NRIS database there are 30 observations of fringed myotis on the Sierra NF, all recorded in the last ten years. Surveys across the Sierra National Forest have detected fringed myotis at several sites including Huntington Lake, Markwood Meadow, Buck Meadow and the Sweetwater Mine. NRIS records show that six fringed myotis bats have been captured in mist-netting surveys on the forest (USDA 2015).

Key ecological conditions for this species (see above for additional details)

In general, this species is found in open habitats that have nearby dry forests and an open water source and is known to roost under bark and in cavities of snags. Additional roosting habitat occurs on the forest in the form of caves and mines.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Snags are ephemeral features on the landscape with presence or absence dependent on both natural and human induced patterns of disturbance. The forest assessment for the Sierra, notes that the number of large trees and snags are low and highly variable across all forest types. In all conifer types, there is less than 5 large trees (less than 30 inch diameter) per acre. In addition, the densities vary radically across the landscape as large trees are not evenly distributed. Most areas have a few large trees per acre and some patches, often previously disturbed (timber harvest or wildfire), have none or they are unevenly

distributed across the landscape. Very large tree (trees > 40" dbh) densities are typically less than one to two trees per acre. Again, many areas are devoid of large trees. In conifer-hardwood forests, large tree levels are also somewhat low, with trees < 24" dbh ranging from 4 to 6 per acre. Large snags show similar patterns to large trees, but with lower densities and higher variation. Calculations of snags greater than 15 inches diameter show the range is from 1 to 4 snags per acre in conifer forests. As with large trees, the numbers are lower for conifer-hardwood, generally less than 3 snags per acre and numbers are calculated to be even lower in the oak woodland. Snags are especially variable in distribution with some patches containing large numbers from recent wildfires or where insects or disease killed groups of trees and other areas containing few dead trees. Large snags can stand for longer periods of time (decades) than smaller diameter snags (often less than a decade).

The 1,400-acre Nelder Grove Historical Area contains 106 mature giant sequoias intermingled in a second-growth forest of Sierra Nevada mixed conifer forest (white fir, incense cedar, ponderosa pine, sugar pine, black oak, and canyon live oak). This area was heavily logged through the 1890s, and almost all trees that were under eight feet dbh were cut. Further, there has been a lack of vegetation treatment, timber harvest or major fuels reduction projects, since the mid-1990s and there is now a significant amount of dead and downed wood covering the area. An ongoing policy of fire suppression has contributed to the heavy fuel load and reduced germination of redwoods. (Smith 2013).

Gold mining on the northern part of the Sierra NF has a long history that continues today with many small operators who are strongly influenced by current high gold prices. There are 491 inventoried Abandoned Mine Lands (AML) on the Sierra National Forest AML database spread across the forest (see Figure 1 in the Living Assessment for the Sierra NF.). Approximately, 71 AML sites are located within designated wilderness lands. There are approximately 49 underground mines, 61 surface operations, 30 placer mining operations, 28 surface-underground operations, and 3 wells located within the Sierra National Forest. Three hundred twenty of the inventoried AML sites have unknown operation types. Mine sites have been assessed since 1985 and restoration operations are ongoing. Several of these mines have adits or shafts that have been closed with bat gates and require periodic review of the condition of the gates to ensure they are still functional and or need maintenance. As of 2017, bat gates have been placed in five AML sites, although monitoring data collected on a subset of 16 AML sites from 2012-2017 show only one positive detection for bats (Sierra NF data, K. Taneka pers comm).

The 338-acre Kings Cavern Geological Area includes three major cave systems with at least 16 entrances and up to 2,000 feet of passageways. This cavern system developed in marble bedrock, representing a metamorphosed remnant of sedimentary bedrock predating the intrusion of the granitic batholiths that formed the Sierra Nevada Range. This is the most extensive and well-preserved cavern on the Sierra NF. Access is limited and distant from population centers. This promotes preservation of the cave features.

The Kaiser Wilderness has several small caves that vary from 33 feet to 860 feet in length. Field reconnaissance has discovered at least three different cave systems in the Kaiser Wilderness. These caves are all located in sinkholes at the bottom of drainages. Four of these caves are eligible for nomination as significant caves because of unique characteristics in geologic, hydrological and recreational features. Biological and cultural features have not been thoroughly conducted. The location of these caves is considered sensitive information under the Federal Cave Resources Protection Act of 1988.These caves are likely subject to frequent exploration and potential damage. Biological surveys are ongoing and evidence of bat use has been observed at a number of the caves (USFS Sierra National Forest Kaiser Wilderness- Twin Lakes Caves 2002).

The projected status of those ecological conditions relative to the species considered

Anticipated trends include higher fuel loading and changes in forest structure and composition associated with fire suppression and changing climate related events (e.g. drought, insect outbreaks). These changes may have both negative and positive effects on forest dwelling species that rely on snags. Fire events may increase opportunities for roosting sites; however recruitment into larger tree size classes could become an issue in the long-term. Mixed conifer vegetation type is trending toward overstocked conditions which increases its risk from both fire and insect and disease mortality elements.

Nelder Grove has received little treatment and continues to be suppressed from fire. As a result this area is trending toward an increasing threat to the grove from uncharacteristic wildfire which may even scorch fire resistant redwood trees and would likely severely damage most of the white wood (non-redwood) trees in the grove.

The amount of cliffs, small rock depressions and small cave (i.e., grottos) habitat is not expected to change; although outside factors (see Recreation below) could negatively affect their status.

The amount of roost sites in the form of buildings and other structures has likely increased since the reference period due to increasing population levels and human development.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Bats have slow reproductive rates with usually one pup per year putting maternity roosts particularly at risk from disturbance and abandonment during summer months when young are not yet volant (typically June-July) and human activity may be higher.

Forest management activities: Historic fire suppression has led to increased tree densities and changes in forest structure and composition. Historic timber harvest practices removed large snags or trees bearing cavities (18 to 26 inches diameter at breast height), conifer snags or large numbers of tall snags in early to medium stages of decay (Chung-MacCoubrey 1996; Lacki and Baker 2007). The Sierra NF moved away from even-aged reforestation management 20 years ago to stand maintenance thinning harvests intended to control density and growth of stands. This was done generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production. It also increases growth rates on the remaining trees. Remaining trees grow larger and faster than those in untreated stands. For restoration purposes, in several vegetation types, especially mixed conifer, reforestation implemented in a group selection, all-aged silvicultural application can increase stand heterogeneity and manage stands for resiliency and wildlife habitat. This should benefit species like fringed myotis. Removal of snags through forest tree removal activities could impact fringed myotis if trees are being used as maternity roost particularly because the species can congregate in large numbers at roost sites. Additional habitat (snags, mixed conifer forests) will be lost to wildfire, however, based upon wildfire records, it is not anticipated that future fires would impact a significant amount of streamside riparian habitat where bats forage (USDA 2017).

Recreation: Risk of recreation-related disturbance to bats in caves, mines, and buildings are general threats, but these were not identified as specific threats to fringed myotis on the Sierra NF. The forest continues to install bat caves as additional needs are identified.

Mining: Mining overall on the Sierra NF has declined. However, gold mining on the northern part of the forest continues by many small operators who are motivated by current high gold prices.

Wind Energy: It is unlikely that transmission corridors will be developed on the Sierra NF in the future; wind energy will likely not be produced on the forest during the current planning horizon.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Fringed myotis have a limited distribution on the Sierra National Forest and suitable forest habitat is at high risk from stand replacing fire. In addition, the number of large trees and snags are low and highly variable across all forest types. Because an entire maternal colony could be concentrated in one snag, removal of even one snag could have an adverse effect on the local breeding population. Small mining operations and recreation may pose an additional risk factor from disturbance at maternity and/or roosting sites. Range-wide population trends are unknown, for fringe myotis, but likely declining with many historically occupied sites no longer occupied. For all these reasons, there is substantial concern about this species' ability to persist on the planning unit. Based upon the evidence and supporting best available science, this species does meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Sierra marten - *Martes caurina sierrae*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to Sierra marten

Martens are extremely sensitive to the loss and fragmentation of mature forest habitat (Zielinski 2014). From a relatively continuous higher elevation distribution in the early 1900s, marten have retracted to isolated and discontinuous populations (Zielinski et al. 2005). Marten are impacted by loss of contiguous old forest breeding habitat from multiple sources, including timber harvest/thinning, vegetation management, extensive tree mortality resulting from drought-mediated insect and disease, and wildfire. Climate change also poses a serious threat due to the predicted increase in higher elevation fires. Recreational activities and roads (with associated roadkill) further increase habitat fragmentation. Additionally, the use of illegal rodenticide poisons to protect marijuana plantations is present throughout the marten's range in the Sierra Nevada (Gabriel et al. 2012).

Rationale for Sierra marten

NatureServe Global Rank: G4G5

NatureServe T Rank: T3

State Rank: S2S3

Other Designations: FS-SS; CA-SSC; CA-SGCN

Nationally, martens in the Sierra Nevada are ranked G4G5 (Apparently Secure/Secure) by NatureServe but S3 (Vulnerable) in California. The *sierrae* subspecies is NatureServe ranked as T3, indicating they are thought to be vulnerable and at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. Martens are listed as "*Species of Special Concern*" (SSC) by California Department of Fish and Wildlife and were designated a "*Species of Greatest Conservation Need*" (SGCN) in the California State Wildlife Action Plan (CDFW 2015). Sierra marten are Region 5 Forest Service sensitive species and MIS.

Martens use habitat at multiple spatial scales, including resting/denning, stand, home range and landscape (Zielinski 2014), and the areas used may differ by season (Martin and Barrett 1991, Spencer 1987). Sierra martens primarily occupy mature coniferous forests, typically more mesic than xeric (Buskirk and Powell 1994), supporting large-diameter trees and snags, multi-layered canopies (Fuller 2006), large downed logs, moderate-to-high canopy closure, structurally diverse and complex understory and interspersed riparian areas and meadows. These features provide resting and denning sites, as well as escape and thermal cover. In one Sierra Nevada study, martens specifically selected riparian forests for foraging (Spencer et al. 1983).

Coniferous forest types important to Sierra Nevada marten include red fir (*Abies magnifica*), lodgepole pine (*Pinus contorta*), subalpine conifer, mixed conifer-fir, Jeffrey pine (*Pinus jeffreyi*), and eastside pine. Marten are more prevalent in the upper montane zone of the Sierra, Stanislaus and Inyo national forests but will utilize lower montane forests as well as meadows (Zielinski et al. 1983).

The physical structure of the forest, including large live and dead trees, coarse woody debris, and a relatively low and closed canopy, appears more important for Sierra martens than species composition (Spencer et al. 1983, Hargis and McCullough 1984). Martens prefer forests with overhead cover and complex ground structure to allow winter access to subnivean (below snow) spaces (Buskirk and Powell 1994). The arboreal habits of martens may have been exaggerated in early research (Buskirk 1994), when

in fact, they find much of their food on the ground or under snow. A preference for physical structure or overhead cover is thought to arise from a need for protection from predators and, in areas of deep snow, access to subnivean areas provided by complex structures on the ground such as logs and rocks. Dens occur both in hollow trees (usually within cavities) and on or under the ground in logs or rock piles.

Martens demonstrate a high sensitivity to loss and fragmentation of mature forest habitat, seldom occupying an area after more than 30 percent of mature forest has been harvested (Bissonette et al. 1997, Potvin et al. 2000). Indeed, Moriarty et al. (2011) postulate that even the total amount of habitat may not be the most important determinant of marten occurrence. Rather, attributes of the landscape like core patch size, distance and spatial configuration of patches and microhabitat features within patches may be very important (Hargis et al. 1999). Vegetation management activities must therefore be cognizant of these elements, many of which occur in the understory.

Although talus fields are occasionally used, martens usually avoid open areas, and even small openings less than 50 meters (164 feet) across negatively affect use of an area by martens (Heinemeyer 2002). This behavior is attributed to predator avoidance. How marten use the habitat via movements, both seasonally and daily, appears to coincide with prey availability **(**Zielinski et al. 1983). Microtine rodents are particularly common dietary items, with birds, squirrels, and vegetation also reported (Martin 1994).

Marten appear to be very sensitive to removal of key resting and breeding habitat features from their home ranges. Moriarty et al. (2011) provide compelling evidence for a decline in the marten population on the Sagehen Experimental Forest (SEF) affected by the loss and fragmentation of habitat associated with decades-long timber harvest that consisted of clear-cut, shelterwood and salvage sales. This study documented a substantial decline in the number of martens detected. Key factors contributing to decline in marten numbers on the Sagehen site included decreases in habitat patch size, acres of core habitat area, total marten habitat and an increase in the distance between habitat patches (Moriarty et al. 2011). Loss and fragmentation of suitable habitat in the form of large live and dead/dying trees reduce availability of resting/denning sites (Moriarty et al. 2011). Reduced understory complexity may affect prey habitat and indirectly reduce the ability of marten to forage effectively (Moriarty et al. 2011, 2016); marten movement dynamics change as forest complexity declines, which results from alterations in foraging strategy and predator avoidance behavior.

Adult survival is the factor most critical for marten population sustainability (Buskirk et al. 2012), so the ability to avoid predation in structurally complex forests is a critical factor for marten. This has implications for energetic balances in these small carnivores (Taylor et al. 1970). Functional connectivity is mandatory for a species like marten to persist in fragmented landscapes (Moriarty et al. 2015). In fact, marten populations consistently decline or reach extirpation in areas below a threshold of 65-75% forest cover (Hargis et al. 1999, Moriarty et al. 2011).

Andruskiw et al. (2008) concluded that vegetation management actions reducing understory complexity have implications for marten prey as well as reducing the ability of martens to forage effectively. This effect was particularly notable in regenerating stands as opposed to older uncut stands. The same understory effects may also function to decrease marten escape cover, rendering them more visible to predators (Drew 1995). In general, martens avoid stands with simplified structure (Moriarty et al. 2016) and may use habitat differently in the summer as opposed to the winter (Zielinski et al. 2015).

The anticipated effects of climate change in the plan area include increased fires, especially an increase in higher elevation fires, which may result in a dramatic reduction in the forested habitat this species is dependent upon. Martens are extremely sensitive to the loss and fragmentation of mature forest habitat (Zielinski 2014). Changes could include a loss of red fir (Lenihan et al. 2003) and lodgepole pine habitat

(replacement by white fir or loss due to catastrophic wildfire) and increased competition from other carnivores (e.g., fisher) no longer constrained by snow levels. Also, because of the marten's declivity to cross large openings, large fires may fragment marten habitat and isolate populations leading to localized extinction. Habitat connectivity for an old forest-associated species like marten should contain a mosaic of vegetation types and structures that provide foraging and breeding habitat, and movement. Finally, increased drying conditions would lead to further desiccation of montane meadows. Drier meadows would likely reduce the prey populations upon which martens depend.

The southern extreme of the range for martens is within the plan area. Conventional ecology indicates that populations at the edges of their range 1) are more at risk than those in the center and 2) harbor more genetic diversity and thus the ability to adapt to changing environmental conditions. Lawler et al. (2012) predicted that as a result of changing climate, the range of marten in California will contract northward in latitude and upward in elevation, become less common, and functionally fragment. Climate change is predicted to alter fire regimes and facilitate fatal tree infections such as insect and disease. Predicted long-term trends toward warmer temperatures are likely to decrease snowfall and observations already suggest upper montane forests and associated species are migrating to higher elevations following the shifting snow line (Lawler et al. 2012). These same authors predict that a marten competitor, fisher (*Pekania pennanti*), may follow the warming climate upward and expand into current marten range.

Habitat quality for martens would likely be affected by both management actions and climate change. A vulnerability assessment by Hauptfeld et al. (2014) ranked overall vulnerability of the marten as moderate/high, due to its moderate/high sensitivity to climate and non-climate stressors, moderate adaptive capacity, and moderate/high exposure. Martens are also listed as "Climate Vulnerable" in the 2015 California State Wildlife Action Plan (CDFW 2015).

Recreational activities and roads that fragment contiguous habitat or compact snow also affect marten. The only study to examine the effects of OHV's (not used on snow) on martens in the Sierra Nevada found that martens appeared unaffected by OHV noise disturbance, remaining present in both the control and OHV use areas (Zielinski et al. 2008). Over snow vehicles have a potential impact to marten populations via several mechanisms. First, compacted snow from grooming and riding snowmobiles may facilitate access to marten habitat for predators and competitors that typically would not be able to traverse deep snows (Buskirk et al. 2000). There may also be snow compaction effects to the subnivean zone (Bunnell et al. 2006, Zielinski 2014). Martens and sables commonly appropriate the dens or subnivean refugia of prey species taken in winter, resulting in a much stronger dependence upon prey species (Zielinski 2015). Impacts to these below snow areas will affect both prey populations and marten resting habitat in the critical winter season.

A study on ski area effects was conducted in the Lake Tahoe Basin region of California and Nevada to assess marten population dynamics and habitat use (Slauson and Zielinski 2013). Ski resort development and operation creates habitat loss, fragmentation and potential behavioral disturbance. Snow compaction results from grooming (see OSV discussion). Marten movement was strongly affected by the width of individual ski runs, as well as by the cumulative width of runs that had to be crossed to move between habitat patches; females were less willing to cross the openings than males (Slauson and Zielinski 2013).

Habitat occupancy by martens was seasonally affected, with significant reductions within ski area operation boundaries during the winter (*Ibid*). There was not a reduction in occupancy during spring and summer, suggesting that the combination of habitat alteration and the winter activities themselves are the factors responsible for decreased winter habitat use (*Ibid*).

Areas within ski area operation permitted acreages may also be developed for spring/summer/fall use such as toboggan slides, mountain biking, zip lines and canopy rides. The effects of these have yet to be empirically examined, but potential for habitat quality degradation is evident if forested habitats are cleared to create a new footprint (D. Macfarlane, pers. comm.). Also, impacts in the form of construction or use are potentially greater if conducted during the marten kit-rearing season from March to August (Slauson and Zielinski 2013). In contrast, Kucera (2004) examined marten use of the Mammoth Mountain ski area near the Inyo National Forest in 2002-2003. This is an east-side, drier, less productive Sierra Nevada habitat. Kucera (2004) identified a seasonal use pattern, with marten ski area occupancy in the winter when prey is least available and anthropogenic food sources are readily available, followed by movement into unmanaged forest in the spring.

Roads affect martens directly via road kill of individuals as well as indirectly by providing a route for entry of marten predators and competitors into habitat they would otherwise be unable to negotiate (Slauson et al. 2010, Zielinski 2014), especially in winter. Predators include coyote, red fox, bobcat, and great horned owl (Bull and Heater 2001).

Another significant documented direct as well as cumulative impact is the use of illegal rodenticide poisons to protect marijuana plantations (Gabriel et al. 2012). It should be noted that this marijuana growing activity is extensive, illegal, and neither authorized, funded, nor carried out by the Forest Service. Nonetheless, the impact to all predators is significant, and cumulatively presents a detrimental effect to population health, survival and status.

In summary, key limiting factors affecting Sierra marten and their habitats are forest fuels reduction treatments, fire, insect and disease tree mortality, climate change and anticoagulant rodenticide poisoning. Recreational uses and development may also play a limiting role as marten are pushed upslope by climate change into smaller and more isolated patches of suitable habitat. Most of these factors are system drivers that serve to limit and fragment suitable Sierra marten habitat in California. These are clearly associated in scientific literature with declines in mature forest conditions.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

The Sierra NF has 402 records of Sierra marten in the NRIS database. Incidental observations are numerous but den sites have not been located (Figure 5).

Key ecological conditions for this species (see above section for additional details)

Structurally diverse mature conifer forests; abundant snags and down logs; heterogeneous habitat for cover and prey species, high canopy cover (40-60%). Similar to fisher in that resting/denning structures are the most critical habitat elements.

On the Sierra NF, marten habitat can be found in the Upper Montane Zone where snow is the primary precipitation. Red fir forests co-occur with Jeffrey pine in the rockier sites and western white pine can be found on more productive sites. Wetter sites, where the water table remains high in the summer, may contain pure stands of lodgepole pine. Shrub-dominated areas occur where sites have been logged or otherwise disturbed by past forest management activities. Granitic outcrops are abundant in this zone as well, with many forest endemics and other rare plants. In addition, meadows and riparian habitats close to conifer forest provide important prey species and cover.

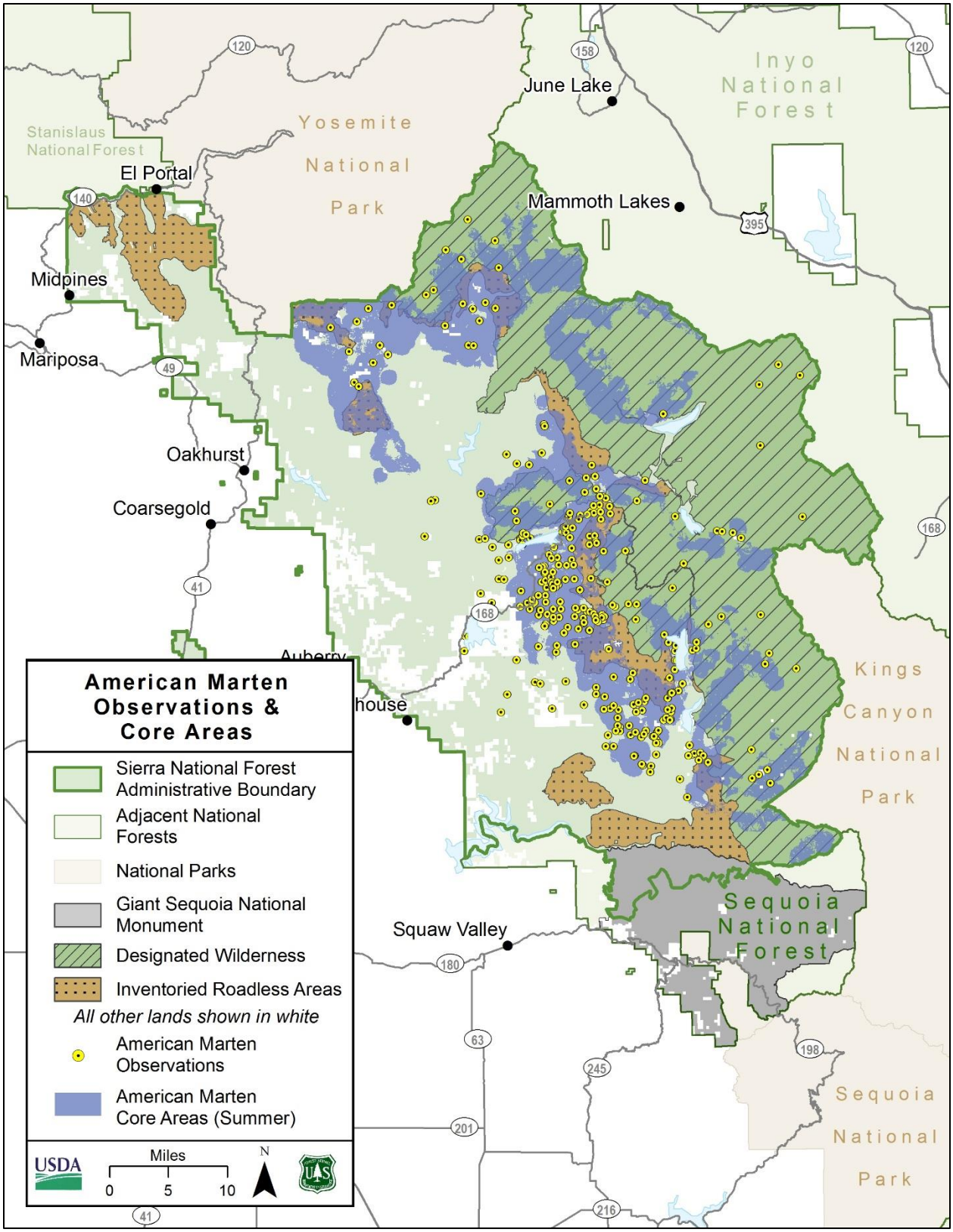

Figure 5. Sierra marten observations and core areas on the Sierra National Forest

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Risk of loss of habitat and habitat fragmentation of conifer forest from wildfire outside the natural range of variability. While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sierra NF, substantial areas are at very low fire resiliency index and susceptible to higher amounts of crown fire than expected. Total area burned annually is far below historic levels (Stephens et al. 2007, North et al. 2012) resulting in denser, more uniform forests and shrubfields (Collins and Skinner 2013). This in turn has led to more uniform, high severity fires (van Wagtendonk and Fites-Kaufman 2006, Miller et al. 2009, Collins and Stephens 2010, Miller and Safford 2012).

Live and dead fuels have increased to abnormally high levels of abundance, greater than the natural range of variability. This results in forests that are highly susceptible to the types of large-scale, high-severity fire which can negatively affect long term forest sustainability and eliminate or substantially alter older-age forests that contain large trees that are critical to species like marten. The Sierra NF landscape has experienced decades of fire exclusion and according to the forest wide assessment the mean fire return interval is highly departed for mixed conifer forests (+40% to greater than 85% mean frequency departure) in most areas of the forest.

The forest assessment for the Sierra, notes that the number of large trees and snags are low and highly variable across all forest types. In all conifer types, there is less than 5 large trees (less than 30 inch diameter) per acre. In addition, the densities vary radically across the landscape as large trees are not evenly distributed. Most areas have a few large trees per acre and some patches, often previously disturbed (timber harvest or wildfire), have none or they are unevenly distributed across the landscape. Very large tree (trees > 40” dbh) densities are typically less than one to two trees per acre. Again, many areas are devoid of large trees. In conifer-hardwood forests, large tree levels are also somewhat low, with trees < 24” dbh ranging from 4 to 6 per acre. Large snags show similar patterns to large trees, but with lower densities and higher variation. Calculations of snags greater than 15 inches diameter show the range is from 1 to 4 snags per acre in conifer forests. As with large trees, the numbers are lower for conifer-hardwood, generally less than 3 snags per acre and numbers are calculated to be even lower in the oak woodland. Snags are especially variable in distribution with some patches containing large numbers from recent wildfires or where insects or disease killed groups of trees and other areas containing few dead trees. Large snags can stand for longer periods of time (decades) than smaller diameter snags (often less than a decade).

The Sierra National Forest has incurred tree mortality in recent years (USDA 2017). Approximately 1/3 of the Forest has died and it continues to move up in elevation. The majority of the ponderosa pine belt has died. Bark beetles have created areas with dead trees greater than 10” DBH. Moderate and dense tree cover is mostly heavily affected by drought induced insect mortality. The most affected areas are found at elevations below 6,000 feet.

Current Sierra National Forest vegetation types as defined by the CWHR indicate the follow acreages on the Sierra NF as potential habitat for marten:

Jeffrey Pine (28,585), Lodgepole Pine (32,168), Red fir (141,303), Sierran Mixed Conifer (269,921), Subalpine Conifer (179,348) and wet meadow (19,355).

The projected status of those ecological conditions relative to the species considered

In general, large scale uncharacteristically severe wildfire are expected to increase in frequency and intensity, poses a risk to marten habitat. Bark beetle outbreaks are expected to further exacerbate already

dry conditions and increase fire risk. Future projections estimate that bark beetle and other forest insect activity will increase because of climate changes such as elevated temperatures, frequent drought, and current high risk conditions (dense vegetation) of western forests (Bentz et al. 2010). Forest Health Monitoring risk maps (USDA FS 2012b) show substantial risk of increased tree mortality (greater than 25 percent basal area lost) in the next 15 years due to bark beetles and other pest complexes (see maps in the Insect and Pathogen supplemental report). Droughts may become frequent and prolonged, and it can be expected that mortality will be proportional (Smith 2007). Warming and drying climate are expected to greatly increase the likelihood and risk of widespread and elevated insect and pathogen outbreaks (Fettig 2012).

The following estimates from the living assessment snapshot show projected trend (2012-2032) for each forest type potentially used by marten. Approximate percentage of each habitat type on the Sierra NF are in parentheses.

Coniferous Forest, Early Seral (3.4): Decreasing trend most likely due to fire suppression, salvage logging, and natural succession shifting forests into mid-seral condition.

Coniferous Forest, Complex Early Seral (Unknown): Decreasing trend due to past fire suppression, salvage logging, reforestation (by humans), and mechanical thinning.

Coniferous Forest, Mid Seral (19.9): Gradual decreasing trend. Major loses are projected if large scale, high intensity fires occur in these forests due to high fuel loads.

Coniferous Forest, Late Seral, Closed Canopy (11.5): Gradual increasing trend as the large amounts of mid-seral stands progress into late-seral forests. The continued management framework would retain nearly all trees >30 inches dbh, thus increasing the number of stems per acre.

Coniferous Forest, Late Seral, Open Canopy (0.2): This small amount of habitat is predicted to remain stable although possibly increasing as a result of closed canopy forests shifting into open canopy forests as a result of potentially increased mortality.

Wet Meadow (1.4): Decreasing trend expected if: 1) pace and scale of meadow restoration does not increase, such as by reducing tree encroachment, removing roads and trails from meadows that cause a change in hydrology, eliminating grazing impacts that result in drying of meadow systems and cause a change in hydrology; and 2) continued climate changes resulting in less water availability.

Overall, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function and composition (Meyer 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Roads/recreation: There is no road that crosses the mountains on the Sierra NF, however, State Highway 41 and State Highway 140 access the northern half of the forest and State Highway 168 accesses the

southern portion. The forest has approximately 180 miles of double lane paved roads which are considered main line arterials. The forest also has two Forest Service designated national scenic byways.

Climate change: Reduction in snow depth would have negative effects on marten who use subniveal dens. Warming temperatures and loss of high elevation snow pack put Sierra marten at particular risk from climate change. According to the DEIS, martens (along with fisher) have high climate vulnerability ratings. Many models project significant range contractions in some species distributions, those with high climate sensitivity and low adaptive capacity. For example, alpine plants and animals that live at the highest elevations will have few if any other places to go to stay in the colder environments they are adapted to. Species with low adaptive capacity include those that have small and isolated populations, low genetic variation, and limited ability to move widely and low reproductive rates. For example, it is predicted that the conditions that support marten presence in California are likely to change greatly over the next century, potentially causing a pronounced loss of suitable habitat (Lawler et al. 2012). Marten are closely associated with red fir forests, which are dependent upon snowpack. Lawler et al. (2012) suggest that marten will be highly sensitive to climate change, with the largest impacts in the southern Sierra Nevada (Lawler et al. 2012).

Vegetation management/fuels reduction treatments: Can add to habitat loss and fragmentation and creation of open spaces which subject martens to predation and restrict movement. The Sierra NF moved away from even-aged reforestation management 20 years ago to stand maintenance thinning harvests intended to control density and growth of stands. This was done generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production. It also increases growth rates on the remaining trees. Remaining trees grow larger and faster than those in untreated stands. For restoration purposes, in several vegetation types, especially mixed conifer, reforestation implemented in a group selection, all-aged silvicultural application can increase stand heterogeneity and manage stands for resiliency and wildlife habitat. These patches would create early seral stage patches of shrub or younger age class trees. Within the mixed conifer, about 90 percent of the lands are classified as saw timber stands, eight percent in pole stands, and only three percent in the seedling or sapling stages. Increasing early seral stages would address restoration of vegetative characteristics concerning issues such as hiding cover by providing patches with more diverse understory cover.

Connectivity: Connectivity of old-forest associated species like marten is high on the Sierra NF; there is no road that crosses the mountains on the Sierra NF and there has been an absence of large, stand-replacing fires for over 50 years. However, high intensity fire may pose a future risk to connectivity. Weather conditions conducive to intense fire are already increasing with climate change and are expected to increase in the future. Connectivity of early seral habitat, particularly complex early seral habitat is unknown but likely limited due to fire suppression and past forest management. There are five wildernesses on the Sierra National Forest totaling 546,059 acres; Ansel Adams, Dinkey Lakes, Kaiser, John Muir, and Monarch wildernesses. The Dinkey Lakes and Kaiser Wildernesses are entirely on the Forest. The Ansel Adams and John Muir share management with the Inyo National Forest and the Monarch is managed by the Sequoia National Forest (Refer to Chapter 15 of the Assessment for more information on Wilderness).

Grazing: can reduces the amount of shrub and herbaceous cover available for prey species such as voles. On the Sierra NF grazing and fire exclusion has allowed tree cover to encroach on meadows and riparian areas, reducing herbaceous cover for marten prey species and effectively reducing meadow size.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

There is no information on current marten population size or density estimates for the Sierra Nevada, however, marten habitat has been fragmented, distribution is reduced, and suitable habitat has also been reduced and isolated in parts of the range. There have been no documented denning sites with young on the Sierra National Forest, however it is likely den sites exist because the species has persisted on the forest over time. Martens frequently change den locations and surveys for dens are intensive, making it difficult to locate them and estimate levels of abundance. Martens may move back and forth between Sierra National Forest and the adjacent Inyo and Sequoia National Forests as well as Yosemite National Park. The mixed conifer forests on the Sierra National Forest are at high risk of loss from stand replacing wildfire. This primary risk, coupled with declining and/or small population numbers of the marten range wide, and reduced snow pack resulting from climate change, may put the species at future risk. This may be of particular concern with regard to range contraction given the Sierra National Forest's location at the edge of the species southern-most range. For all these reasons, there is substantial concern about this species' ability to persist on the planning unit and adjacent landscape. Based upon the evidence and supporting best available science, this species does meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Townsend's big-eared bat - *Corynorhinus townsendii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Threats include human disturbance, improper mine/cave closure, white-nose syndrome, low fecundity or high first-year mortality.

Rationale for Townsend's big-eared bat

NatureServe Global Rank: G4

NatureServe T Rank: T3T4

State Rank: S2

Other Designations: CESA-Candidate Threatened; FS-SS; BLM-SS; CA-SSC; CA-SGCN

The Townsend's big-eared bat has a global rank of G4 (apparently secure) and California state rank of S2 (imperiled). There are five known subspecies and phylogenetic evaluation concluded that *Corynorhinus townsendii townsendii* is the only subspecies occurring in California (Piaggio and Perkins 2005, Piaggio et al. 2009). This evaluation considers the Townsend's big-eared bat at the species level and acknowledges that the subspecies present within the plan area is *Corynorhinus townsendii townsendii.*

The subspecies Townsend's Western big-eared bat (*Corynorhinus townsendii townsendii*) occurs throughout California and has a global rank of G3G4 (vulnerable to apparently secure), a subspecies rank of T3T4 (vulnerable to apparently secure), and California state rank of S2 (imperiled).The Townsend's big-eared bat is classified as a sensitive species by Region 5 of the Forest Service and the Bureau of Land Management; the California Department of Fish and Wildlife classifies it as Candidate Threatened, Species of special concern, and species of greatest conservation need; and the Western Bat Working Group considers it a high priority species. This species is vulnerable due to high sensitivity to disturbance of roosting sites and strong affinity for specific cave habitat requirements.

Caves and cave-like roosting structures and hibernacula comprise its most critical habitat features; roost zones are in cooler air near the cave or mine entrance (Barbour and Davis 1969a, Kunz and Martin 1982). Historically, the Townsend's big-eared bat was found throughout California as a scarce, but widespread species (Barbour and Davis 1969a). Research suggests substantial declines throughout California over the past 40 to 60 years, including an estimated 54 percent decline in individuals, 52 percent decline in maternity colonies, and a 45 percent decline in available roosts (Pierson and Rainey 1998b). The most marked declines occurred in the central Sierra Nevada (Pierson and Rainey 1998b).

The species is highly vulnerable to human disturbance in or adjacent to caves, in particular hibernacula and nursery sites (Zeiner et al. 1990, Piaggio and Perkins 2005, Gruver and Keinath 2006). The species is particularly vulnerable during the maternity season, when females are aggregated and rearing defenseless young (Pierson and Rainey 1998b); In fact, a single visit may result in abandonment of the entire roost (Barbour and Davis 1969a, Zeiner et al. 1990). Townsend's big-eared bats have low fecundity and high first-year mortality; therefore, populations are slow to recover (Pierson et al. 1999). Improper closure of caves or mines can eliminate access to roosting habitat and potentially trap bats if timing is not appropriate (Pierson and Rainey 1998b, Gruver and Keinath 2006).

In addition to the existing, known threats, an emerging threat is white-nose syndrome. White-nose syndrome is a highly-contagious infection of hibernating bats and it has been associated with massive mortality of cave-hibernating bat species in the northeastern United States (Blehart et al. 2009). This disease has rapidly spread throughout the eastern United States and Canada since its discovery in 2006 and was recently discovered in Washington State in March of 2016 (Lorch et al. 2016). Townsend's big-eared bats (*Corynorhinus townsendii townsendii*) are not known to be affected by white-nose syndrome. *Pseudogymnoascus destructans,* the fungus that causes the disease known as white-nose syndrome, has been detected on a close relative, the Virginia big-eared bat (*Corynorhinus townsendii virginianus*) but they have not been documented to have the disease (Coleman 2014). Additionally, another close relative in the affected area, Ozark big-eared bat (*Corynorhinus townsendii ingens*) has not yet been confirmed to have white-nose syndrome or the fungus (Coleman 2014). Although unknown at this time, white-nose syndrome could have significant negative impacts to Townsend's big-eared bats if it becomes established in the plan area.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

In the NRIS database, the Sierra NF has 16 records all within the vicinity of Shaver Lake (Shaver Lake Recreation area) on the High Sierra Ranger District. There are 6 CNDDB records, including from Shaver Lake, Markwood Creek, and Glen Meadow Creek areas. Townsend's bats have either been caught or recorded on acoustical detectors during surveys that were conducted approximately five miles west of the Exchequer Restoration project area (USDS 2017). It is currently unknown what the population trend or occupancy rate is for this species on the forest.

Key ecological conditions for this species (See above for additional details)

This species uses multiple ecosystem types for foraging and uses habitat which contains rocks (canyons, caves, mines, ledges, talus slopes, and cliffs), and or manmade habitat (buildings, bridges) as well as large trees and snags for roosting. The primary limiting factor for this species is adequate roosting habitat, especially in caves and mines. Townsend's bats are among the most dependent of all North American bats on abandoned or inactive mines.

Foraging habitat, and secondary roost sites in large snags and trees, occur in the montane zone where varied mixtures of ponderosa pine or Jeffrey pine, black oak, sugar pine, incense cedar, and white fir dominate, with some red fir at higher elevations. Foraging associations include edge habitats along streams and areas adjacent to and within a variety of wooded habitats (Brown et al. 1994, Fellers and Pierson 2001, Pierson et al. 2002 *in* Krueger 2016).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Suitable roosting habitat occurs on the forest in the form of caves and mines. Gold mining on the northern part of the Sierra National Forest has a long history that continues today with many small operators who are strongly influenced by current high gold prices. There are 491 inventoried abandoned mine lands on the Sierra National Forest. Abandoned mine lands database spread across the forest (see Figure 1 in the Living Assessment for the Sierra NF). Approximately, 71 abandoned mine lands sites are located within designated wilderness. There are approximately 49 underground mines, 61 surface operations, 30 placer mining operations, 28 surface-underground operations, and 3 wells located within the Sierra National Forest. Three hundred twenty of the inventoried abandoned mine lands sites have unknown operation types. Mine sites have been assessed since 1985 and restoration operations are ongoing. Several of these mines have adits or shafts that have been closed with bat gates and require periodic review of the condition of the gates to ensure they are still functional and or need maintenance. As of 2017, bat gates have been placed in five abandoned mine lands sites, although monitoring data collected on a subset of 16 abandoned mine land sites from 2012-2017 show only one positive detection for bats (Sierra NF data, K. Taneka pers comm).

The 338-acre Kings Cavern Geological Area includes three major cave systems with at least 16 entrances and up to 2,000 feet of passageways. This cavern system developed in marble bedrock, representing a metamorphosed remnant of sedimentary bedrock predating the intrusion of the granitic batholiths that formed the Sierra Nevada Range. This is the most extensive and well-preserved cavern on the Sierra NF. Access is limited and distant from population centers. This promotes preservation of the cave features.

The Kaiser Wilderness has several small caves that vary from 33 feet to 860 feet in length. Field reconnaissance has discovered at least three different cave systems in the Kaiser Wilderness. These caves are all located in sinkholes at the bottom of drainages. Four of these caves are eligible for nomination as significant caves because of unique characteristics in geologic, hydrological and recreational features. Biological and cultural features have not been thoroughly conducted. The location of these caves is considered sensitive information under the Federal Cave Resources Protection Act of 1988. These caves are likely subject to frequent exploration and potential damage. Biological surveys are ongoing and evidence of bat use has been observed at a number of the caves (USFS Sierra National Forest 2002).

The projected status of those ecological conditions relative to the species considered

The amount of cliff, cave, and cave-like habitat is not expected to change; management activities would not substantially affect cliff, cave, or cave-like structures, although outside factors (below) could negatively affect their status. Mine closures if adequately gated can provide increased roosting habitat. Mining claims have the potential to increase in the future which could create additional adits and shafts for bat use.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Recreation and Disturbance

Maternity colonies can be impacted by renewed mining activities, inappropriate mine closures, and disturbance during human visitation. Structures such as adits or buildings that support cave-associated species could be altered or removed, closed and or gated improperly. The forest is actively working to survey abandoned mines or caves that may be hazardous and has been gradually installing bat/wildlife friendly gates at these sites.

Disturbance of cave hibernacula by recreationists is another potential threat, however bat gates should minimize this threat.

Vegetation Management

About 7,940 acres or 2 percent of open, mid and closed canopy coniferous forest habitat has been burned in wildfires within the Forest. Green forest snag habitat has been lost as a result. It is likely that additional wildfires could impact some portion of the habitat. According to historical fire records of the High Sierra Ranger District, it is likely that about 1,866 additional acres of wildfire will occur on the district in the foreseeable future; however, the updated acres for wildfire increased tremendously this year due to the Rough Fire on the High Sierra RD and the Willow Fire on the Bass Lake RD. The same acreage is assumed for the Bass Lake RD. Therefore, it is reasonable to assume that additional habitat will be lost to wildfires. Based upon wildfire records, it is not anticipated that future fires would impact a significant amount of streamside riparian habitat (USDA 2017).

Disease

Due to the cave roosting nature of Townsend's big ear bat, White-nose Syndrome (WNS) is a potential future threat. However, with the exception of one case in Washington State, there are no documented cases of this disease in the west (Bat Conservation International 2017). In addition, bat species which have been hardest hit by WNS are characterized by colonies with large clustering behavior and caves with higher humidity levels (Marroquin et al. 2017).

Energy Development

The Forest has no transmission corridors, and there are no existing or planned transmission corridors as identified in the West-Wide Energy Corridor Final Programmatic Environmental Impact Statement Nov 28 2008 and Record of Decision Jan 14 2009 passing through the Sierra National Forest.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Townsend's big-eared bat has a ranking of G4 (apparently secure) in NatureServe and a California state rank of S2 (imperiled). There are few detections on the forest but the primary roosting habitat (i.e., caves and mines) this species uses is at or above reference conditions. There are no known maternity colonies on the forest. The Sierra National Forest is actively installing bat friendly gates which provide protection for known hibernacula for all bat species. This effort may also increase potential roosting habitat by way of retired and or new mining adits. However, limited occurrence data for this species on the forest, coupled with low reproduction rates and the potential for recreational disturbance to cave systems in the Shaver Lake area are considerable risk factors. Based on the consideration of all these factors there is sufficient information to demonstrate substantial concern for long-term persistence in the plan area. Based upon the evidence and supporting best available science, Townsend's big-eared bat meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Amphibians

Foothill yellow-legged frog - *Rana boylii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Altered flow regimes in streams and rivers for hydroelectric power, water storage and water delivery; degradation of riparian habitat; disease; invasive species; pesticides; drought and climate change.

Rationale for Species

NatureServe Global Rank: G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: CA-Endangered; FS-SS; BLM-SS; CA-SSC; CA-SGCN

The foothill yellow-legged frog is currently under review for listing on the federal Endangered Species List (United States Department of the Interior 2015) and the state Endangered Species List and is considered a Priority 1 Species of Special Concern by the California Department of Fish and Wildlife (Thomson et al. 2016). It is also ranked as Vulnerable (G3) by NatureServe Global, Vulnerable (S3) By NatureServe State, and Near Threatened by the IUCN. Given population declines throughout the Plan Area (Kupferberg et al. 2012, Thomson et al. 2016), and continued risks to existing stream habitats and populations, substantial concern for long-term persistence of the foothill yellow-legged frog exists in the plan area.

Foothill yellow-legged frog is known from Coast Ranges from northern Oregon through California and into Baja California, Mexico, and also from the foothills of Sierra Nevada and southern Cascade Range in California. The species has been known to occur on most national forests in Region 5. Since about 1970, foothill yellow-legged frogs (*Rana boylii*) have disappeared from significant areas in California and Oregon, including parts of the Sierra Nevada (Hayes et al. 2016).

Alterations to the natural flow regime in rivers and streams within the plan area can have direct mortality effects and indirect negative effects on foothill yellow-legged frogs by altering habitat availability and quality. Pulsed flows from dam releases can lead to scouring or stranding of egg masses and tadpoles resulting in reduced occurrence and population sizes in regulated river systems compared to unregulated rivers (Kupferberg et al. 2012). Even when flow regimes are managed for salmonids, there can be negative consequences for the frogs because late-season cold water releases cause delays in metamorphosis, which reduce overwinter survival of newly metamorphosed frogs (Railsback et al. 2016). Regulated reaches are also more likely to support invasive species that compete with or predate on *R. boylii* (e.g., Fuller et al. 2011). Furey et al. (2014) found that Didymosphenia, an invading species of stalked diatom that is unpalatable to aquatic grazers such as larval *R. boylii*, can carpet benthic environments in regulated reaches of the American and Feather River systems causing food shortages for tadpoles. Illegal marijuana production in California is centered in sensitive watersheds with high biodiversity (Bauer et al. 2015), and has been observed in the Southern Sierra Nevada.

In headwater streams above major dam sites in the plan area, additional stressors such as human disturbances, drought, and disease can affect population persistence. The proliferation of trespass

cannabis grow sites can damage aquatic habitat quality by diverting water and adding detrimental toxicants to headwater streams (M. Gabriel and A. Cummings, pers. comm.). Kerby and Sih (2015) found that a non-lethal concentration of the pesticide carbaryl interacts with other stressors, such as the presence of non-native crayfish, to reduce survival of foothill yellow-legged frog tadpoles by 50 percent. Drought can impact foothill yellow-legged frogs by causing drying of normally perennial streams resulting in the stranding of tadpoles and recently metamorphosed frogs. The deadly amphibian disease chytridiomycosis, caused by the fungal pathogen *Batrachochytrium dendrobatidis* (Bd), has recently been implicated in a die-off of *R. boylii* in a San Francisco Bay area watershed (Adams et al. 2017), and Bd has been found to be prevalent in *R. boylii* populations in southern CA (Adams pers. com.) and northern CA (Pope et al. 2016).

The current distribution of *R. boylii* is strongly correlated with climate variables, which suggests that this species will be sensitive to climate changes that affect stream hydrology (Thomson et al. 2016). In the Sierra Nevada, snowpack losses of 50-90% are predicted by the turn of the twenty-first century resulting in earlier runoff and reduced spring and summer stream flows (Dettinger et al. 2004, Maurer et al. 2007). How frogs will respond to these changes is unknown, but reduced water availability in the Sierra Nevada will likely lead to more conflict with human use of water and affect how regulated reaches are managed, likely to the detriment of this species (Thomson et al. 2016).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

The foothill yellow-legged frog was not relocated in the six historical localities on the Sierra National Forest (Lind et al. 2003). Lind et al. (2003) found the only drainage confirmed to have foothill yellow-legged frogs on the Sierra National Forest is Jose Creek, a tributary of the San Joaquin River that is isolated by the presence of upper Redinger Lake at its mouth. Surveys of Jose Creek have been conducted with varying degrees of intensity since the confirmed population there in 1994. Surveys between 1994 and 2003 detected some adults, juveniles or tadpoles every year; the maximum number of adults found was 19 in 1994, and numbers of adults did not exceed seven after 1994. Surveys of historical sites downstream of Sierra Forest Service lands since 1995 have failed to detect foothill yellow-legged frogs (Hansen 2006). Foothill yellow-legged frogs on the Sierra National Forest appear to be rare and limited in distribution, and may be near extirpation in the region.

Key ecological conditions for this species

Key ecological conditions for the foothill yellow-legged frog are water quality and quantity. This species is found in partially shaded rocky streams in a variety of habitats including: valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral and wet meadows and appear to be highly dependent on flowing water for all life stages (Morey 2007). This is a stream-breeding frog, often associated with larger streams with coarse substrates. However, they also have been found in smaller tributaries, and in areas with finer substrates or bedrock (Olson 2009).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Stream morphology and temperatures may be affected by hydroelectric use on the Sierra National Forest. There are 50 dams and diversions on the Sierra NF, which affect flow over approximately 220 miles of streams. Dams and diversions may contribute to aquatic habitat alteration by blocking aquatic species movement or migration, and may contribute to species isolation. There are approximately 155 stream

miles on the forest which are subject to flow regulation under licenses from the Federal Energy Regulatory Commission (FERC). Streams under FERC licenses have conditions for providing minimum in-stream flows. Water temperatures downstream of dams are affected by volume of flow and temperature of the upstream reservoir. Warming temperatures can further limit distributions of native fishes and other aquatic dependent species, like the foothill yellow-legged frog (USDA 2013).

Fish stocking in rivers, streams, reservoirs, and previously fishless lakes have reduced native fish and amphibians, for example yellow-legged frogs. Other aquatic invasive species, such as quagga mussel and New Zealand mudsnails, have spread throughout California on boats, fishing equipment, and other water sports gear (Moyle 2015).

The projected status of those ecological conditions relative to the species considered

Water quantity and quality, including stream morphology and temperatures, may be affected in the future as hydroelectric use continues and increases. The Forest completed a Settlement Agreement with Southern California Edison in 2008 regarding future operations of several of its hydroelectric facilities. Among the conditions on the new licenses would be increases in minimum instream flow, along with channel and riparian maintenance flows. Increases in flow would augment the amount of habitat available, and possibly reduce water temperatures in some stream segments, providing additional cold water habitat.. This would affect approximately 90 miles of streams when the new FERC license is issued (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Threats to the species include a multitude of factors. Changes in stream temperature or morphology can cause high mortality during the egg and larval life stages. The main causes of mortality in eggs are hydrologic in nature. Eggs are usually killed by either desiccation or scour (Lind et al. 1996, Morey 2007). Tadpole mortality can also occur as a result of irregular stream flows. Illegal marijuana grown on the forest, have unregulated surface water diversions, which in other areas of California can divert up to 23 percent of the annual flows (Bauer et al. 2015).

Loss of genetic diversity due to habitat loss is a major threat to foothill yellow-legged frogs. Populations which are more than 10 kilometers apart are prone to genetic drift and barriers such as dams or habitat fragmentation may prevent dispersal between isolated populations (Dever 2007).

Pesticides can impact these frogs in both original and derived forms. Chloroxon (the oxon derivative of chlorpyrifos) killed all tadpoles exposed to it in Sparling and Fellers (2007) study and was at least 100 times more lethal than the parent chemical. Air-borne pesticides are implicated as the most significant threat to this species, especially for Sierra Nevada populations which are directly impacted by pesticide drift from the central valley (Fellers 2005). Illegal chemicals found at marijuana grown on the forest, can also contribute to degradation of aquatic systems.

Non-native fishes have been introduced or have invaded most waters of the range. These waters include extensive areas that were once fishless at high elevations. Sierra Nevada fisheries have largely shifted from native fishes, especially salmon and other migratory fishes, to introduced fishes (USDA 2013). Predation by non-native, introduced fishes is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) readily consume both larvae and adult frogs and are capable of directly affecting populations of foothill yellow-legged frogs. Additionally, predation or competition with introduced American bullfrogs

(*Rana catesbiana*) likely impact this species (Fellers 2005). Native garter snakes (*Thamnophis* spp.) feed heavily on all life stages of this frog (Morey and Papenfuss 2000).

Parasites pose an additional threat to foothill yellow-legged frogs. The parasite, *Ribeiroia* has been shown to cause severe limb deformities in other frog species and has been found in the vicinity of foothill yellow-legged frogs. Another parasite, Anchor Worm (*Lernaea cyprinacea*), is non-native and typically infects fish but can infect larval foothill yellow-legged frogs which can cause deformities or mortality (Kupferberg et al. 2009). In addition, the most significant parasite that impacts this species is *Batrachochytrium dendrobatidis* which causes amphibian chytridiomycosis. This parasite has been found in this species and has had significant impacts to the similar mountain yellow-legged frog (*Rana sierra* and *Rana muscosa*) and other amphibian species worldwide (Fellers 2005).

Recreation use on the Sierra NF may also pose a risk to foothill yellow-legged frogs and their habitat. Water plays a major role in providing a diverse set of recreation opportunities on the Sierra NF. The upper San Joaquin River and other areas where habitat exists may be at risk as recreational use increases (USDA 2013).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

There are numerous sightings on the Sierra NF, the sightings are in the same relative location and span multiples years. The biggest threats to this species on the Sierra NF are the loss of water quality and quantity due to hydroelectric use, along with illegal marijuana grows, non-native fish and disease. These factors combined with the loss of genetic diversity due to habitat loss, pesticide use, and invasive species competition for habitat and direct mortality puts the foothill yellow-legged frog at significant risk. Climate change is expected to bring warmer temperatures, along with more variability in precipitation and less snow to slowly fill the streams over the season. As a result, *there is substantial concern about this species ability to persist on the planning unit.* Based upon the evidence and supporting best available science, the foothill yellow-legged frog meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Gregarious slender salamander - *Batrachoseps gregarius*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Ground disturbance to microsite conditions, degradation or loss of habitat due to ground disturbance or fire.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: S4

Other Designations: None

Members of the genus *Batrachoseps* are known as the slender salamanders or "worm salamanders" and are a lungless terrestrial salamander of the family Plethodontidae (Nussbaum et al. 1983). They are found only along the Pacific coast of North America, where 19 species have been described in California, Oregon, and Baja California, Mexico (Olson 2008). Genetic studies have also discovered that the genus *Batrachoseps* is the most diverse group of salamanders in western North America (Jockusch and Wake 2002, Jockusch et al. 2012).

In general, slender salamanders do not need standing or flowing water for breeding or any other part of the life cycle (Stebbins 2003). During wet season conditions, slender salamanders can be near the surface and as conditions dry out, this species will retreat to microsite areas where moisture can be found. Microhabitat may include surface cover such as down wood (in or under logs, under bark or boards), rocks, and litter.

Batrachoseps salamanders tend to have very small home ranges. Studies on a similar localized California slender salamander (*B. attenuatus*) found that adult salamanders moved an average of approximately 5

feet over a two year period and were found to repeatedly use the same cover object (Kucera 1997). In general *Batrachoseps* salamanders demonstrate high site fidelity and rarely move more than 5-10 meters over their lifetime (Cunningham 1960, Olson & Kluber 2014).

For terrestrial salamander species, ground disturbance from a variety of sources could directly impact individuals on the surface cover substrate, such as rocks, logs or forest vegetation litter. They can also be negatively affected by fire, but their habitat may be maintained or improved with the restoration of periodic low severity fire. As these species tend to be fairly localized, trends can only be evaluated in the context of known populations and the suitable habitats within their known or potential range (USDA 2013).

The gregarious slender salamander is endemic to California and occurs along the west slope of the central and southern Sierra Nevada Mountains from the southern boundary of Yosemite National Park almost to the Kern River (Jockusch, Wake & Yanev 1998). It also occurs along the northwestern and western portion of the Sierra National Forest.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Approximately 26 gregarious slender salamander locations occur on the Sierra National Forest and are recorded in NRIS. There are no locations for the Sierra NF in CNDDB. The locations span from the northwestern portion of the Forest, near Hogan Mountain and run along the western portion of the Forest, with the most site locations occurring in the Blue Canyon area.

Key ecological conditions for this species

Key ecological conditions for the gregarious slender salamander include oak woodlands, riparian corridors, forest litter, rocks, down logs and woody debris.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Ecological integrity of terrestrial ecosystems varies with location and elevation on the Sierra National Forest. The foothill zone has been the most altered, as a result extensive human development and non-native invasive grasses. Riparian habitat is in various states of ecological integrity. Water development has decreased it in some areas resulting in changes in water flow and timing. Fire suppression has impacted riparian habitat by increasing conifer density and decreasing riparian hardwood and herbaceous vegetation (USDA 2013).

Fire suppression and past vegetation management have also led to increased forest density and fuel loads. Consequently, fires are more intense and can be larger, and forests are more vulnerable to insect and pathogen outbreaks and drought-related tree mortality.

The projected status of those ecological conditions relative to the species considered

As fire severity and intervals increase, degradation and loss of habitat for this species will also increase. More effects of climate change are expected, along with increasing temperatures that produce less snow events. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. Invasive plant species are also expected to increase, especially in the foothills. Once an invasive species dominates a site, fire patterns are expected to change and become more frequent. Land management activities that degrade or remove ground cover or forest litter can also further impact this species.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

This species is most threatened by degradation or loss of habitat (Hansen & Wake 2005). Ground disturbance that alters or removes ground cover, including woody debris and forest litter can directly impact this species.

Additional threats to this species include disease and natural predators. *Batrachochytrium dendrobatidis* has been documented for the California slender salamander (*Batrachoseps attenuatus*), however, the actual impacts of chytridiomycosis on this species is unknown. Natural predators of this species likely include: spotted and striped skunks, ringtails, raccoons, gray foxes, ring-necked snakes, and various skinks, moles and shrews (Krueger 2016).

This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the severity is high enough to remove forest litter and woody debris. Warmer temperatures will also dry the ground, wood, litter, and other cover for salamanders, further restricting the movement of this species and the time that they are active each year.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The gregarious slender salamander occurs along the northwestern and western portion of the Sierra National Forest in oak woodlands and the foothills. The biggest threats to this species on the Sierra NF are degradation or loss of habitat from ground disturbing activities and fire. These factors combined with direct mortality due to predation, disease, and increased stochastic fire events of high intensity, puts the gregarious slender salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the gregarious slender salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Hell Hollow slender salamander - *Batrachoseps diabolicus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Ground disturbance to microsite conditions, degradation or loss of habitat due to ground disturbance, fire or drought.

Rationale for Species

NatureServe Global Rank: G2

NatureServe T Rank: None

State Rank: S3

Other Designations: None

See the gregarious slender salamander section for a general description of members of the genus *Batrachoseps* that are known as the slender salamanders

The Hell Hollow slender salamander is endemic to the foothills of the western slopes of the Sierra Nevada in California, from the north bank of the north fork of the American River, Placer County, to the lower Merced River canyon, Mariposa County (Jockusch, Wake & Yanev 1998).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

A single record exists for the Hell Hollow slender salamander on the Sierra National Forest. This NRIS record is located near Merced River in Mariposa County, which is the southern extent of the known range for this species. No locations are recorded in CNDDB for the Sierra at this time.

Key ecological conditions for this species

Key ecological conditions for the Hell Hollow slender salamander include pine-oak woodlands and chaparral habitat, along riparian zones in close proximity to large rivers and streams. North-facing slopes are preferred, and individuals are usually found beneath rock talus and large stones and other surface cover shaded by oak trees that dominate the region. Summer temperatures are extreme with little to no rainfall.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Ecological integrity of terrestrial ecosystems varies with location and elevation on the Sierra National Forest. The foothill zone has been the most altered, as a result extensive human development and non-native invasive grasses. Riparian habitat is in various states of ecological integrity. Water development has decreased it in some areas through changes in water flow and timing. Fire suppression has impacted riparian habitat by increasing conifer density and decreasing riparian hardwood and herbaceous vegetation (USDA 2013).

Fire suppression and past vegetation management have also led to increased forest density and fuel loads. Consequently, fires are more intense and uniformly severe, and forests are more vulnerable to insect and pathogen outbreaks and drought-related tree mortality (USDA 2013).

The projected status of those ecological conditions relative to the species considered

As fire severity and intervals increase, degradation and loss of habitat for this species will also increase. More climate change is expected and warmer temperatures, along with more rain than snow are occurring. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. Invasive plant species are also expected to increase, especially in the foothills. Once an invasive species dominates a site, fire patterns are expected to change and become more frequent. Land management activities that degrade or remove ground cover or forest litter can also further impact this species (USDA 2013).

Water quality and quantity are at present well within the natural range of variability in most areas of the forest. However, climate change is a stressor which may limit water quality and quantity in the future.

Watersheds are overall in good condition, and most are able to recover from most perturbations imposed by human influence or are within the natural range of variability. However, invasive species, fire, and climate change remain stressors on watershed condition for the Sierra National Forest (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

This species is most threatened by degradation or loss of habitat. Ground disturbance that alters or removes ground cover, including woody debris and forest litter can directly impact this species.

Additional threats to this species include disease and natural predators. *Batrachochytrium dendrobatidis* has been documented for the California slender salamander (*Batrachoseps attenuatus*), however, the actual impacts of chytridiomycosis on this species is unknown. Natural predators of this species likely include: spotted and striped skunks, ringtails, raccoons, gray foxes, ring-necked snakes, and various skinks, moles and shrews (Krueger 2016).

This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the severity is high enough to remove forest litter and woody debris.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The Hell Hollow slender salamander occurs at one site location along the Merced River in the northwest portion of the Sierra National Forest. The biggest threats to this species on the Sierra NF are degradation or loss of habitat from ground disturbing activities, climate change and fire. These factors combined with direct mortality due to predation, disease and increased stochastic fire events of high intensity, puts the Hell Hollow slender salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Hell Hollow slender salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Kings River slender salamander – *Batrachoseps regius*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Ground disturbance to microsite conditions, degradation or loss of habitat due to ground disturbance or fire. Water quantity and quality, including stream morphology and temperatures.

Rationale for Species

NatureServe Global Rank: G2

NatureServe T Rank: None

State Rank: S2S3

Other Designations: FS-SS

See the gregarious slender salamander section for a general description of members of the genus *Batrachoseps* that are known as the slender salamanders

The Kings River slender salamander is endemic to California. This species is found on the western slopes of the Sierra Nevada in Fresno County on the south and east sides of the North Fork of the Kings River, and from Summit Meadow in the drainage of the South Fork of the Kings River. It is also found on the middle fork of the Kaweah River drainage in Tulare County (Jockusch, Wake & Yanev 1998).

Kings River slender salamanders are found along streams and moist canyons, in valley foothill riparian habitat, blue oak woodland and mixed conifer woodland (Kucera 2005). This type habitat for this species is well-shaded, mixed chaparral on north-facing slopes.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Records exist for this species on the Sierra National Forest and are restricted to the Kings River area. Location data is recorded in both NRIS and CNDDB.

Key ecological conditions for this species

Key ecological conditions for the Kings River slender salamander include pine-oak woodlands and chaparral habitat, along riparian zones in close proximity to large rivers and streams. Individuals are usually found beneath rock talus and large stones and other surface cover shaded by oak trees that dominate the region.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Ecological integrity of terrestrial ecosystems varies with location and elevation on the Sierra National Forest. The foothill zone has been the most altered, as a result extensive human development and non-native invasive grasses. Riparian habitat is in various states of ecological integrity. Water development has decreased it in some areas through changes in water flow and timing. Fire suppression has impacted riparian habitat by increasing conifer density and decreasing riparian hardwood and herbaceous vegetation (USDA 2013).

Fire suppression and past vegetation management have also led to increased forest density and fuel loads. Consequently, fires are more intense and uniformly severe, and forests are more vulnerable to insect and pathogen outbreaks and drought-related tree mortality (USDA 2013).

The projected status of those ecological conditions relative to the species considered

As fire severity and intervals increase, degradation and loss of habitat for this species will also increase. More climate change is expected and warmer temperatures, along with more rain than snow are occurring. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. Invasive plant species are also expected to increase, especially in the foothills. Once an invasive species dominates a site, fire patterns are expected to change and become more frequent. Land management activities that degrade or remove ground cover or forest litter can also further impact this species (USDA 2013).

Water quality and quantity are at present well within the natural range of variability in most areas of the forest. However, climate change is a stressor which may limit water quality and quantity in the future. Watersheds are overall in good condition, and most are able to recover from most perturbations imposed by human influence or are within the natural range of variability. However, invasive species, fire, and climate change remain stressors on watershed condition for the Sierra National Forest (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

This species is most threatened by degradation or loss of habitat, and direct mortality due to predation, disease, and increased stochastic fire events of high intensity (Hansen and Wake 2005). Ground disturbance that alters or removes ground cover, including woody debris and forest litter can directly impact this species. Additional threats to this species include disease and natural predators. *Batrachochytrium dendrobatidis* has been documented for the California slender salamander (*Batrachoseps attenuatus*), however, the actual impacts of chytridiomycosis on this species is unknown. Natural predators of this species likely include: spotted and striped skunks, ringtails, raccoons, gray foxes, ring-necked snakes, and various skinks, moles and shrews (Krueger 2016). This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the severity is high enough to remove forest litter and woody debris.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The Kings River slender salamander is restricted to the Kings River area on the Sierra National Forest. The biggest threats to this species on the Sierra NF are degradation or loss of habitat from ground disturbing activities and fire. These factors combined with direct mortality due to predation, disease, and increased stochastic fire events of high intensity, puts the Kings River slender salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Kings River slender salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Limestone salamander - *Hydromantes brunus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Disturbance, degradation or loss of habitat to microsite conditions due to recreation or mining activities. Loss of habitat due to fire or climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: S2S3

Other Designations:ST; FS-SS; BLM-SS; CA-Fully Protected; CA-SGCN

The limestone salamander is a member of family Plethodontidae, the Plethodontid or Lungless Salamanders. Plethodontid salamanders do not breathe through lungs, but rather conduct respiration through their skin and the tissues lining their mouth. As a result, damp environments and microsite areas of high humidity are required habitat characteristic needs Stebbins 2003, 2012).

These salamanders are typically found in association with limestone. They can also be found under slate slabs, irregularly shaped limestone pieces, moss-covered and barren talus, in rock crevices and in abandoned mine tunnels. Typically animals are found on steep slopes, especially those which are north and east-facing, but can be found on level ground as well (Basey and Morey 2000; Wake and Papenfuss 2005). Vegetation at these sites is either mixed chaparral or gray pine-oak woodland (Hammerson and Wake 2004). At the type location the dominant flora consists of: digger pine, toyon, California laurel, manzanita, chamise, buck brush, yerba santa, phacelia, and California wood fern (Gorman 1954). California buckeye may serve as an indicator species for optimal habitat for limestone salamanders (Basey and Morey 2000).

Limestone salamanders presumably feed on insects and other small invertebrates (Basey and Morey 2000). In captivity limestone salamanders have eaten *Batrachoseps* salamanders (Gorman 1954). Water requirements are unknown; however water needs are probably met by rain and subterranean sources (Basey and Morey 2000).

Limestone salamanders are active on the surface when soil is moist and air temperatures are cool. This limits surface activity to winter and early spring, however animals likely remain active underground throughout the year. The holotype of this species was collected in February and animals have been observed active in mine shafts in July. Observations have been made at temperatures ranging from 10 to 14 degrees Celsius with an average temperature of 11.4 degrees Celsius. Home range size and territoriality in this species remains unknown (Wake and Papenfuss 2005). California (Basey and Morey 2000). The total known extent of this species range is approximately sixteen to seventeen kilometers in length along the Merced River. Specifically, this salamander occurs from the vicinity of the type locality on state route 140 west to Hell Hollow and slightly up the North Fork of the Merced River (Wake and Papenfuss 2005).

There are two conservation areas created to protect the state threatened limestone salamander. The first is the Limestone Salamander Ecological Reserve managed by the California Department of Fish and Game which protects 120 acres of habitat including the type location. The second, the Limestone Salamander Area of Critical Environmental Concern, is managed by the Bureau of Land Management which consists of 1600 acres of both confirmed and potential habitat (Hammerson and Wake 2004).

Within Region 5 this salamander is found in foothill areas in the Sierra and Stanislaus National Forests. Although few localities are known from within these forests, contiguous, suitable habitat exists along the North, Middle and South Forks of the Merced River and may contain additional populations (Krueger 2016).

Limestone salamanders are an endemic salamander species found in a small area in Mariposa County, California (Basey and Morey 2000). The total known extent of this species range is approximately sixteen to seventeen kilometers in length along the Merced River. Specifically, this salamander occurs from the

vicinity of the type locality on state route 140 west to Hell Hollow and slightly up the North Fork of the Merced River (Wake and Papenfuss 2005).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Records exist for this species on the Sierra National Forest and are restricted to the Hell Hollow and Merced River area. Location data is recorded in both NRIS and CNDDB.

Key ecological conditions for this species

Key ecological conditions for this species included mossy limestone crevices and talus, typically on steep slopes were moisture and high humidity are retained. Caves and abandoned mines can also provide these ecological conditions.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Although this species has a restricted habitat, limestone habitat on the Sierra NF is not limited.

The projected status of those ecological conditions relative to the species considered

As fire severity and intervals increase, degradation and loss of habitat for this species will also increase. Habitat loss and degradation from mining, vegetation management, road construction, water development, or other forest activities may occur in the foreseeable future. Habitat changes associated with climate change such as warmer temperatures and drought are also expected. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. As a result, microsite conditions on rocky steep slopes that include high humidity and moisture will be impacted (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

As with other species with a limited range, stochastic events are a significant threat to the persistence of this species. Events such as fire, flood, disease, habitat alteration, or climate change can significantly impact a limited range animal. Fire likely has only minimal impact to this species, however fire suppression activities may disturb habitat. No studies have investigated the impact of *Batrachochytrium dendrobatidis* on this species; however its highly terrestrial lifecycle puts it less at risk for serious impact. Habitat alteration such as development for mining, road widening or construction, limestone quarrying and dam building likely pose the greatest threat to this species. As few studies have investigated this species, additional research needs to be conducted to determine what threats are most significant for this species (Krueger 2016).

In addition, these areas are impacted by invasive plant species, habitat fragmentation, surface mining, post-fire disturbance such as intensive grazing, illegal marijuana cultivation, and climate change.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The limestone salamander is restricted to a small area along the Merced River on the Sierra National Forest. The biggest threats to this species on the Sierra NF are degradation or loss of habitat from ground

disturbing activities, such as mining and heavy recreation use. These factors combined with direct mortality due to predation, disease and increased stochastic fire events of high intensity, along with climate change, puts the limestone salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the limestone salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Fish

Central Valley hitch - *Lavinia exilicauda exilicauda*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Fragmented watershed conditions due to dams, altered flow regimes and temperatures in streams and rivers for hydroelectric power, changes in water quantity or quality; habitat loss, competition and predation from invasive species, drought and climate change.

Rationale for Species

NatureServe Global Rank: G4

NatureServe T Rank: T2T4

State Rank: SSC

Other Designations: None

Hitch are deep-bodied cyprinids (minnow and carp family) with a terminal, slightly upturned mouth that can grow to over 350 mm (CDFW 2018). Hitch are most closely related to California roach (*Lavinia symmetricus*) and may interbreed with one another in some areas (Avise et al. 1975). Hitch may also hybridize with Sacramento blackfish, however, offspring are apparently sterile (Moyle and Massingill 1981). Three subspecies of hitch exist in California: the Clear Lake hitch (*Lavinia exilicauda chi*), the Monterey hitch, (*Lavinia exilicauda harengus*), from the Pajaro and Salinas rivers, and the type subspecies, Central Valley or Sacramento hitch (*Lavinia exilicauda exilicauda*) (CDFW 2018).

Habitat requirements for this species include warm, lowland, waters, clear streams, turbid sloughs, lakes and reservoirs. Hitch are omnivorous and feed upon zooplankton and insects, filamentous algae, typically at the water's surface (Moyle 2002). Juveniles tend to feed like trout in pools throughout the summer and usually during the day (Moyle 2002). Pools also provide refuge from predators or high water flow events. Reproduction is also similar to trout, in that hitch will venture into riffle areas to spawn in groups. Once eggs are fertilized and released, they will sink to the gravel layer and swell up by absorbing water, which aides in lodging the interstitial eggs securely to the stream bed (Moyle 2002).

California Fish and Wildlife report the following distribution for *Lavinia exilicauda exilicauda*:

> Hitch were once found throughout the Sacramento and San Joaquin valleys in low elevation streams and rivers, as well as in the Delta. Today they are absent from the San Joaquin River and the lower reaches of its tributaries from Friant Dam down to the Merced River (Brown 2000). Populations have become established through introductions in a few reservoirs, such as Beardsley Reservoir, San Luis Reservoir, and Bass Lake (Fresno County). Sacramento hitch have been carried by the California Aqueduct from San Luis Reservoir to several southern California reservoirs, although it is not known if these are reproducing populations (Moyle 2002). In the

Sacramento River, hitch appear to be spread across much of their native range, up to and including Shasta Reservoir. However, populations are scattered (Moyle 2002) and found only at a few localities and in relatively low numbers (May and Brown 2002). Sacramento hitch are also present in some of the larger tributaries to the San Francisco Estuary (Leidy 2007) and in a few sloughs in the Delta.

The abundance and distribution of Central Valley hitch is poorly documented, although evidence suggests that they are much less abundant than they were historically. Their distribution is also fragmented, with largely isolated populations scattered among various streams, lakes, and reservoirs. May and Brown (2002), in a survey of Sacramento Valley streams, found hitch in small numbers at only a few valley floor locations. CDFG (2007) and Brown (2000) recorded no hitch in extensive sampling of the lower San Joaquin River. Leidy (2007) noted that hitch were present in 13 of 65 watersheds tributary to the lower San Francisco Estuary and "locally abundant" in only seven; all sites were heavily influenced by urbanization. In the Delta, once an area of great natural resource abundance (including a diversity of native fishes), Brown and May (2006) recorded only 24 hitch from an eight year seining program that captured over 43,000 fish of a variety of species. Moyle et al. (2007) captured only small numbers of hitch in a 5 year study of the fishes using the tidal sloughs and floodplain of the Cosumnes River and none in the river itself. Likewise, Nobriga et al. (2005) encountered only 174 hitch in a program that captured over 79,000 fish in the Delta. However, similar numbers were taken in extensive sampling of the Delta in 1961-62 (Turner 1966) suggesting little change in their minority status. Nevertheless, Brown and Michniuk (2007) compared electrofishing captures of native fishes in the Delta between 1980-83 and 2001-2003 and found a general decline in native fishes, including hitch. They also determined that hitch seem to be largely confined to the northern Delta. Feyrer and Healey (2002) concluded that hitch had been extirpated from the southern Delta by the time of their study (1993-94).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

On the Sierra National Forest, *Lavinia exilicauda exilicauda* occurs at Bass Lake to Millerton Reservoir (Santos et al. 2014), however, population numbers and full range extent are not known.

Key ecological conditions for this species

Key ecological conditions for this species include warm, lowland, waters, clear streams, turbid sloughs, lakes and reservoirs

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Stream morphology and temperatures may be affected by hydroelectric use on the Sierra National Forest. There are 50 dams and diversions on the Sierra NF, which affect flow over approximately 220 miles of streams. Dams and diversions may contribute to aquatic habitat alteration by blocking aquatic species movement or migration, and may contribute to species isolation (Moyle et al. 2015). There are approximately 155 stream miles on the forest which are subject to flow regulation under licenses from the Federal Energy Regulatory Commission (FERC). Streams under FERC licenses have conditions for providing minimum in-stream flows. Water temperatures downstream of dams are affected by volume of flow and temperature of the upstream reservoir. Warming temperatures can further limit distributions of native fishes and other aquatic dependent species (USDA 2013).

Fish stocking in rivers, streams, reservoirs, and previously fishless lakes have reduced native fish and amphibians, for example yellow-legged frogs. Other aquatic invasive species, such as quagga mussel and New Zealand mudsnails, have spread throughout California on boats, fishing equipment, and other water sports gear (Moyle et al. 2015).

The projected status of those ecological conditions relative to the species considered

Water quantity and quality, including stream morphology and temperatures, may be affected in the future as hydroelectric use continues and increases. The Forest completed a Settlement Agreement with Southern California Edison in 2008 regarding future operations of several of its hydroelectric facilities. Among the conditions on the new licenses would be increases in minimum instream flow, along with channel and riparian maintenance flows. Increases in flow would augment the amount of habitat available, and possibly reduce water temperatures in some stream segments, providing additional cold water habitat. This would affect approximately 90 miles of streams when the new FERC license is issued (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Activities that reduce water flow may impact this species. In addition, limited dispersal ability of this species and fragmented populations due to dams put it at further risk for localized extinctions. Non-native fishes have been introduced or have invaded most waters of the range. These waters include extensive areas that were once fishless at high elevations. Sierra Nevada fisheries have largely shifted from native fishes, especially salmon and other migratory fishes, to introduced fishes (USDA 2013). Predation by non-native, introduced fishes are a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) may readily consume juvenile Central Valley hitch. Additionally, predation from introduced American bullfrogs (*Rana catesbiana*) likely impact this species.

Recreation use on the Sierra NF may also pose a risk to Central Valley hitch and its habitat. This species is vulnerable to water pollution and this may increase with recreation (Santos et al. 2014). Water plays a major role in providing a diverse set of recreation opportunities on the Sierra NF. The upper San Joaquin River and other areas where habitat exists may be at risk as recreational use increases (USDA 2013).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The biggest threats to this species on the Sierra NF are the loss of water quality and quantity due to hydroelectric use. Their distribution is also fragmented, with largely isolated populations scattered among various streams, lakes, and reservoirs. These factors combined with direct mortality due to predation, recreation use, stochastic events and climate change that affect water temperatures, put the Central Valley hitch at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Central Valley hitch meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Moyle, P. B. 2002. Inland Fishes of California. Berkeley: University of California Press 502 pp.

Moyle, P.B., R. M. Quiñones, J. V. Katz and J. Weaver. 2015. Fish Species of Special Concern in California. Sacramento: California Department of Fish and Wildlife. www.wildlife.ca.gov

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Hardhead - *Mylopharodon conocephalus*

Is there scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern:

Yes

Relevant threats to species:

Small populations, fragmented watershed conditions due to dams, altered flow regimes and temperatures in streams, habitat loss, habitat diversion, decline in water quality, and invasive species.

Rationale for Hardhead:

NatureServe Global Rank: G3

NatureServe T Rank: None

State Rank: S3

Other Designations: FS-SS; CA-SGCN

NatureServe lists hardhead as vulnerable to extinction at both the global (G3) and state level (S3) for the entire population which includes the Sacramento-San Joaquin basin and the Russian River. In 2013, hardhead were designated on Regional Foresters Sensitive Species list.

The California State Wildlife Action Plan (SWAP) listed hardhead as a species of special concern and a species of greatest conservation need (CDFW 2015). Hardhead received a determination score of 3.4 indicating moderate concern with the highest risk factor being their sensitivity to habitat alterations associated with flow, turbidity and temperature (Moyle et al. 2015). This determination score[3] is used to describe the major anthropogenic factors limiting, or potentially limiting, viability of populations of fish in California.

Hardhead are typically found in small to large streams in a low to mid-elevation environment. Hardhead may also inhabit lakes or reservoirs. All ages are omnivores though the juvenile and adult fish have a slightly different diet and tooth structure for feeding. In general these fish will eat benthic invertebrates, aquatic plants, algae, and insects. Hardhead within a stream tend to prefer warmer temperatures than salmonids and they are often found associated with pikeminnows and suckers. According to Fangue et al (2015) adults were lethargic at 11 °C and juveniles frequently refused to swim at 11 and 16 °C, but all fish swam well at 21 and 25 °C. These results suggest that hardhead are well suited for sustained aerobic

[3] Metrics for determining the status of fish species in California, where 1 indicates the species is facing major negative factors contributing to status, 5 indicates the factors have no or positive effects on status, and 2-4 are intermediate values. A full description of the rating protocol and descriptions of the factors is found in the methods section of California Fish Species of Special Concern (Moyle et al. 2015).

activity over a range of flow velocities, at moderate temperatures (ca. 16 to 21 °C). Therefore the hardhead minnow is usually found in clear deep streams with a slow but present flow. Most hardhead reach sexual maturity at 3 years and spawn in the spring around April-May, though spawning may take place as late as August. Hardhead [in small streams] seldom move more than one kilometer away from home pools (Grant and Maslin 1999). Fish in larger rivers or lakes often move up to 30-75 km to find suitable spawning grounds. Though spawning may occur in pools, runs, or riffles, the bedding area will typically be characterized by gravel and rocky substrate. Upon hatching, young larval hardhead remain under vegetative cover along stream or lake margins. As the juveniles grow they may move to deeper water or be swept downstream to larger rivers below. Adult hardhead may live up to 9 or 10 years.

Historically, hardhead were regarded as widespread and locally abundant (Moyle 2002). Hardhead are still fairly widespread in the foothill streams, but their specialized habitat requirements, combined with widespread alteration of downstream habitats, has resulted in most populations being localized and isolated and more vulnerable to localized extinctions (Moyle 2002).

California's populations of hardhead minnow, have experienced population decline overall, possibly due to habitat perturbations, including dam construction with consequent temperature changes and the introduction of non-native species to California's mid- to low-elevation streams especially in the southern part of their range (Moyle 2002).

This species occurs in scattered tributaries of the San Joaquin River but not in the valley reaches of the river (Moyle 2002). Elevational range is 10 to 1,450 meters (http://calfish.ucdavis.edu). Hardhead minnows are found in the Kern River Upper Tehachapi-Grapevine Watershed; South Fork Kern Watershed; and rivers along the east side of the San Joaquin Valley and the Sierra and Sequoia National Forests.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species occurs on the San Joaquin River, Willow Creek, and Kings River, with the only stable population located within a stream reach between two dams that provide stable aquatic conditions and protections from non-native fish predators, including sunfish and bass.

Key ecological conditions for this species

Key ecological conditions for this species include small to large streams in a low to mid-elevation environment; clear deep streams with a slow but present flow; occasionally clean cool lakes or reservoirs; and gravel and rocky substrate for spawning.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Stream morphology and temperatures may be affected by hydroelectric use on the Sierra National Forest. There are 50 dams and diversions on the Sierra NF, which affect flow over approximately 220 miles of streams. Dams and diversions may contribute to aquatic habitat alteration by blocking aquatic species movement or migration, and may contribute to species isolation. There are approximately 155 stream miles on the forest which are subject to flow regulation under licenses from the Federal Energy Regulatory Commission (FERC). Streams under FERC licenses have conditions for providing minimum in-stream flows. Water temperatures downstream of dams are affected by volume of flow and temperature of the upstream reservoir. Warming temperatures can further limit distributions of native fishes and other aquatic dependent species (USDA 2013).

Fish stocking in rivers, streams, reservoirs, and previously fishless lakes have reduced native fish and amphibians, for example yellow-legged frogs. Other aquatic invasive species, such as quagga mussel and New Zealand mudsnails, have spread throughout California on boats, fishing equipment, and other water sports gear (Moyle 2015).

The projected status of those ecological conditions relative to the species considered

Water quantity and quality, including stream morphology and temperatures, may be affected in the future as hydroelectric use continues and increases. The Forest completed a Settlement Agreement with Southern California Edison in 2008 regarding future operations of several of its hydroelectric facilities. Among the conditions on the new licenses would be increases in minimum instream flow, along with channel and riparian maintenance flows. Increases in flow would augment the amount of habitat available, and possibly reduce water temperatures in some stream segments, providing additional cold water habitat. This would affect approximately 90 miles of streams when the new FERC license is issued (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Activities that reduce water flow may impact this species. In addition, limited dispersal ability of this species and fragmented populations due to dams put it at further risk for localized extinctions. Non-native fishes have been introduced or have invaded most waters of the range. These waters include extensive areas that were once fishless at high elevations. Sierra Nevada fisheries have largely shifted from native fishes, especially salmon and other migratory fishes, to introduced fishes (USDA 2013). Predation by non-native, introduced fishes is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) may readily consume juvenile hardhead minnow (Moyle et al. 2015)

Recreation use on the Sierra NF may also pose a risk to hardhead minnow and its habitat. Water plays a major role in providing a diverse set of recreation opportunities on the Sierra NF. The San Joaquin River and other areas where habitat exists may be at risk as recreational use increases (USDA 2013).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The abundance and distribution of the hardhead minnow hitch is relatively well documented, and evidence suggests that they are much less abundant than they were historically. Their distribution is also fragmented, with largely isolated populations scattered among various streams, lakes, and reservoirs on Forest. The biggest threats to this species on the Sierra NF are the loss of water quality and quantity due to hydroelectric use. These factors combined with direct mortality due to predation, recreation use, stochastic events and climate change that affect water temperatures, put the hardhead minnow at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the hardhead minnow meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered:

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Kern brook lamprey - *Entosphenus hubbsi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Fragmented watershed conditions due to dams, altered flow regimes and temperatures in streams and rivers for hydroelectric power, agriculture and mining activities; changes in water quantity or quality; habitat loss, competition and predation from invasive species, drought and climate change.

Rationale for Species

NatureServe Global Rank: G1G2

NatureServe T Rank: None

State Rank: S1S2

Other Designations: FS-SS; SSC; SGCN

The Kern brook lamprey was originally described in the genus *Entosphenus*. The taxonomic status of the genus *Lampetra* is under debate (see Vladykov and Kott 1976); Robins et al. (1991) retained *Lampetra* as the genus and regarded *Entosphenus* as a subgenus. Apparently, *L. hubbsi* was derived from parasitic *L. tridentata* (Lee et al. 1980). Other nonparasitic species in this genus occur in southcentral California and in the Pit and Klamath River drainages in northern California. *L. hubbsi* apparently is distinctive from all others (Starnes 1995). See Moyle et al. (1989) for comparative morphological data on California *Lampetra*.

Moyle (2002) indicated that the principle habitats of the Kern brook lamprey are silty backwaters of rivers emerging from the Sierra foothills (mean elevation of 135 meters with a range from 30 to 327 meters). Ammocoetes are usually found in shallow pools and along edges of runs where water velocity is low. Ammocoetes favor substrates that are a mixture of sand and mud ranging in depth from 30 to 110 centimeters, where summer temperatures rarely exceed 25 degrees Celsius (Brown and Moyle 1993). This habitat also characterizes the lightless siphons of the Friant-Kern Canal, where ammocoetes are abundant at times. Presumably, siphon populations do not contribute to the survival of the species, because adults derived from them would wind up in the aqueduct itself. Adults in natural environments seek riffles with gravel for spawning and rubble for cover. Based on the times at which adults are collected, Kern brook lampreys undergo metamorphosis in fall and spawn in spring. Other aspects of its life history are not known, but are presumed to be similar to those of the western brook lamprey.

The Kern brook lamprey (Vladykov and Follett 1976) is endemic to the east side of the San Joaquin Valley, California, with only six known populations that are isolated from one another; five are in short reaches below dams, so their persistence depends on dam operations and maintenance of suitable habitats for ammocoetes. Locations include lower reaches of the Merced, Kaweah, Kings, and San Joaquin Rivers (Moyle et al. 1989, Moyle 2002); and the Friant-Kern Canal, east of Delano, Kern County, California, which apparently provides ammocoete habitat but not spawning habitat. Lampreys with low numbers of trunk myomeres (i.e. mussel subunits) reported from the upper San Joaquin River between Millerton Reservoir and Kerckhoff Dam, as well as those collected in the Kings River above Pine Flat Dam (Fresno County), may also be *L. hubbsi* (Moyle et al. 1989, Moyle 2002). Apparently the species is thinly distributed throughout the San Joaquin drainage, with populations isolated from one another, at elevations of 30 to 327 meters (Moyle et al. 1989, Moyle 2002). The California Fish Website (http://calfish.ucdavis.edu/species/?uid=39&ds=241) lists 8 watersheds for this species: Middle San Joaquin-Lower Chowchilla Watershed, Middle San Joaquin-Lower Merced-Lower Stanislaus Watershed, Mill Watershed, Tulare-Buena Vista Lakes Watershed, Upper Dry Watershed, Upper Kaweah Watershed, Upper King Watershed, and Upper Merced Watershed.

Moyle (2002) rated Kern brook lamprey as 2.0 (vulnerable) which means “sufficiently threatened to be on a trajectory toward extinction if present trends continue and of special concern; the species is in decline, so species management is needed to keep it from becoming threatened or endangered."

Moyle also specified that relatively few unequivocal collections of this species have been made since it was first discovered in 1976. This is because most collections are ammocoetes that cannot be reliably distinguished from those of western brook lamprey, a more broadly distributed species. Probable populations are thinly scattered throughout the San Joaquin drainage and isolated from one another (Brown and Moyle 1993). This fragmented distribution makes local extirpations likely, without the potential for recolonization, followed by eventual extinction. The probability of local extirpation is

increased because all known populations but one are below dams, where regulated discharges result in fluctuations or sudden drops in flows that may strand or desiccate ammocoetes.

Although existing data are sparse, Nawa (2003) noted that each of the four species of lamprey from the west coast of North America (Pacific lamprey, river lamprey, western brook lamprey, and Kern brook lamprey) is likely to become extinct or endangered with extinction in the foreseeable future throughout all or parts of their range in the coterminous United States.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

The Kern brook lamprey occurs in the Kings, Merced and San Joaquin River systems on the Sierra National Forest in extremely isolated population segments.

Key ecological conditions for this species

Key ecological conditions for this species include cool lowland waters, clear streams and silty backwaters of large rivers.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Stream morphology and temperatures may be affected by hydroelectric use on the Sierra National Forest. There are 50 dams and diversions on the Sierra NF, which affect flow over approximately 220 miles of streams. Dams and diversions may contribute to aquatic habitat alteration by blocking aquatic species movement or migration, and may contribute to species isolation. There are approximately 155 stream miles on the forest which are subject to flow regulation under licenses from the Federal Energy Regulatory Commission (FERC). Streams under FERC licenses have conditions for providing minimum in-stream flows. Water temperatures downstream of dams are affected by volume of flow and temperature of the upstream reservoir. Warming temperatures can further limit distributions of native fishes, other aquatic dependent species like Kern Brook lamprey (USDA 2013, Santos et al. 2014).

Fish stocking in rivers, streams, reservoirs, and previously fishless lakes have reduced native fish and amphibians, for example yellow-legged frogs. Other aquatic invasive species, such as quagga mussel and New Zealand mudsnails, have spread throughout California on boats, fishing equipment, and other water sports gear (Moyle et al. 2015).

The projected status of those ecological conditions relative to the species considered

Water quantity and quality, including stream morphology and temperatures, may be affected in the future as hydroelectric use continues and increases. The Forest completed a Settlement Agreement with Southern California Edison in 2008 regarding future operations of several of its hydroelectric facilities. Among the conditions on the new licenses would be increases in minimum instream flow, along with channel and riparian maintenance flows. Increases in flow would augment the amount of habitat available, and possibly reduce water temperatures in some stream segments, providing additional cold water habitat. This would affect approximately 90 miles of streams when the new FERC license is issued (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Lamprey species depend on muddy bottoms, backwater areas, and low gradient areas during their larval life stage. Lampreys are greatly affected by loss of wetlands, side channels, back eddies, and beaver ponds (PSMFC 1997). Channelization, floodplain filling, and destruction of riparian vegetation is widespread in low-gradient stream areas favored by lamprey for spawning and rearing. River channelization negatively impacts larval lamprey habitat by increasing stream velocity, thereby reducing depositional areas favored by larval lamprey (Close et al. 2002). High stream temperatures resulting from the destruction of riparian vegetation are a likely limiting factor because lampreys prefer temperatures below 20 degrees Celcius (BioAnalysts 2000).

Activities that reduce water flow may impact this species. Limited dispersal ability of this species and fragmented populations due to dams put it at risk for localized extinctions. Similar to dams, culverts that pass adult salmonids are often barriers to lamprey. A systematic survey of lamprey in the Alsea Basin, Oregon found lampreys were often absent above road culverts (Kostow 2002). Stream diversions can kill juvenile and adult lamprey by stranding due to artificial lowering of the water level, or because the diversions are unscreened or the lamprey can get under or through the screens (Kostow 2002; BioAnalysts 2000). Kostow (2002) reports that most lamprey die after passing through dredges. Suction dredging for gold would also likely kill developing eggs and ammocoetes (Nawa 2003).

Bridge crossings, roads, and irrigation ditches make eradication from accidental spills or intentional chemical treatment a high-risk threat. Lampreys are particularly vulnerable to chemical spills because populations in a basin may concentrate in one stream (Kostow 2002, Nawa 2003). Since lamprey ammocoetes take up to six years before metamorphosing, six years of production are lost during a chemical poisoning.

Non-native fishes have been introduced or have invaded most waters of the range. These waters include extensive areas that were once fishless at high elevations. Sierra Nevada fisheries have largely shifted from native fishes, especially salmon and other migratory fishes, to introduced fishes (USDA 2013). Predation by non-native, introduced fishes is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) may readily consume juvenile Kern brook lamprey. Additionally, predation from introduced American bullfrogs (*Rana catesbiana*) likely impact this species (Moyle et al. 2015). The actual impact from these threats on population trends of Kern brook lamprey is not known.

Water plays a major role in providing a diverse set of recreation opportunities on the Sierra NF and recreation use may also pose a risk to the Kern brook lamprey and its habitat. Most areas that are accessible to camping or off-road vehicles and other use may affect ammocoetes habitat or disrupt spawning (Santos et al. 2014). The San Joaquin River and other areas where habitat exists may be at risk as recreational use increases (USDA 2013).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The abundance and distribution of the Kern brook lamprey is relatively well documented, and evidence suggests that they are much less abundant than they were historically. Their distribution is also fragmented, with largely isolated populations scattered among several river systems on the Sierra National Forest and throughtout the range. The biggest threats to this species on the Sierra NF are the loss of connectivity and water quality and quantity due to hydroelectric use. These factors combined with direct mortality due to predation, recreation use, along with stochastic events and climate change that affect water temperatures, put the Kern brook lamprey at significant risk. *There is substantial concern about this species ability to persist on the planning unit.* Based upon the evidence and supporting best

available science, the Kern brook lamprey meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Terrestrial Invertebrates

Indian Yosemite snail - *Monadenia yosemitensis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Disturbance, degradation or loss of habitat to microsite conditions due to recreation or mining activities. Loss of habitat due to fire, drought conditions, and climate change.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: S1S2

Other Designations: CA-SGCN

Monadenia yosemitensis, also known as Yosemite Mariposa Sideband, is a member of the genus Monadenia, air-breathing land snails in the family Monadeniidae. This genus first documented in the late 1890s by Pilsbry, became a highly complex genus over the past century, with dozens of species and subspecies discovered. The genus Monadenia is widespread throughout the west coast of North American, ranging from the upper northern coast of Alaska down to southern portions of California (Burke 2013).

The majority of Monadenia species inhabit forest conditions, however, some species, such as Dalles sideband, *Monadenia fidelis minor,* (Duncan 2005a) and Indian Yosemite snail *Monadenia yosemitensis*, utilize rocky outcrops and scree slopes where moisture is present from seeps and springs. Typical habitat in forested conditions includes substrate that retains moisture, such as leaf litter, down woody debris, live vegetation, rocks, needle litter and duff. Since Mondenia species lack an operculum, microsite conditions with wet, moist substrate or high humidity are essential. In seasons of low precipitation, Monadenia will estivate and form a mucous covering or "door" over the aperture area to retain body moisture, until conditions become favorable for movement and feeding. Microsite conditions also favor areas where calcium is readily available, since land snails and most mollusks require calcium as a nutrient source for shell growth.

Most land snails, including Monadenia species, are foraging generalists and will feed on live and dead material. They are essential in ecosystems as detritivores and decomposers, along with providing a link to ecosystem food chains. In addition, due to limited mobility, home ranges, tend to be very small, only a few acres in some cases (Burke 2013). As a result, microsite conditions may be the most important factor limiting terrestrial snail abundance, since the assemblage of habitat components including access to a substrate of calcareous carbonate (often cliffs habitats or talus slopes), sufficient

moisture (even in arid environments), and food consisting of herbaceous materials such as decaying leaf litter are critical for persistence (Burch and Pearce 1990).

The Indian Yosemite snail occurs on limestone outcrops on the western foothills of the Sierra Nevada. This area experiences dry, xeric conditions with less than six inches precipitation annually and as a result, limited moisture that is available is essential for respiration and often hatching of eggs. This species has very little capability to disperse and even relatively small barriers are limiting. Drought and climate changes are threats as well as stochastic events that might affect the limited range of this species.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species is found only in Mariposa County, at the boundary of Yosemite National Park and Sierra National Forest, along the Merced River near the South Fork confluence. There are 7 occurrences recorded in CNDDB, with 2 occurrences on the Sierra National Forest: one along the Merced River about a mile from the confluence with the South Fork of the Merced River; and the other along the South Fork of the Merced River about a quarter mile from Hite Cove.

Key ecological conditions for this species

Key ecological conditions for this species include mossy limestone crevices and talus, typically on steep slopes where moisture and high humidity are retained. Caves and abandoned mines may also provide these ecological conditions.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Although this species has a restricted habitat, limestone habitat and rocky outcrop habitat on the Sierra NF is not limited.

The projected status of those ecological conditions relative to the species considered

Connectivity of habitat is important because this species has limited movement capability and is restricted to limited times of the year for movement. Mollusks which inhabit rocky habitats also utilize the surrounding forest areas for foraging and dispersal during moist, cool conditions. Seasonal deep refugia include talus deposits and outcrops, which contain stable interstitial spaces large enough for snails to enter. These seasonal refugia also provide protection from fire and predation during inactive periods (Duncan 2005b).

As fire severity and intervals increase, degradation, connectivity and loss of habitat for this species will also increase. Since land snails have limited mobility, poor active dispersal ability, and are very sensitive to desiccation, they are highly vulnerable to fire itself and to subsequent habitat destruction (Burke 1999). In consequence, post-fire return of this group is expected to be slow. According to Burke (1999), intense fire events can result in the persistence of only a small fraction of mollusk fauna for many years (possibly a century or more). Less-severe fires leaving numerous large, minimally charred logs in the stand result in a greater portion of mollusk survival (Burke 1999).

Warming temperatures and longer droughts associated with climate change is expected. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. As a result, microsite conditions on rocky steep slopes that include high humidity and moisture will be impacted (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

As with other species with a limited range, stochastic events are a significant threat to the persistence of this species. Events such as fire, flood, drought, habitat alteration or climate change can significantly impact a limited range animal. Habitat alteration such as development for mining, road widening or construction and limestone quarrying likely pose the greatest threat to this species. As few studies have investigated this species, additional research needs to be conducted to determine what threats are most significant for this species. In addition, these areas are impacted by invasive plant species, habitat fragmentation, surface mining, intensive grazing, illegal marijuana cultivation, and climate change.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The Indian Yosemite snail is restricted to limestone and rocky outcrop habitat on the Sierra National Forest. The biggest threats to this species on the Sierra NF are degradation or loss of habitat from ground disturbing activities, such as mining, heavy recreation use and drought. These factors combined with direct mortality due to predation, increased stochastic fire events of high intensity, along with climate change, puts the Indian Yosemite snail at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Indian Yosemite snail meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Merced Canyon Shoulderband - *Helminthoglypta allynsmithi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Disturbance, degradation or loss of habitat to microsite conditions due to recreation or mining activities. Loss of habitat due to high-intensity fire, drought conditions and climate change.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: S1

Other Designations: CA-SGCN

Helminthoglypta allynsmithi is a member of the genus Helminthoglypta, air-breathing land snails in the family Helminthoglyptidae. This genus first documented in the late 1880s by Ancey, but the taxonomy became highly complex over the past century, with multiple attempts of taxonomical re-classification (Jordan and Black 2015). Pilsbry originally assigned this genus to the family Helminthoglyptidae in 1939 and since then most malacologists have followed this recognition. The genus Helminthoglypta is less widespread throughout the west coast of North American, ranging from western Oregon down to southern portions of California and into the Baja area (Duncan 2004).

This genus is associated with rocks and woody debris in rocky areas within forest habitats, often adjacent to areas with substantial grass or seasonal herbaceous vegetation. Seasonal deep refugia include talus deposits and outcrops, which contain stable interstitial spaces large enough for snails to enter. These seasonal refugia also provide protection from fire and predation during inactive periods. Within rocky habitat, the species is also associated with subsurface water, herbaceous vegetation and deciduous leaf litter, generally within 30 m (98 ft.) of stable talus deposits or rocky inclusions (Jordan and Black 2015).

Since Helminthoglypta species lack an operculum, microsite conditions with wet, moist substrate or high humidity are essential. In seasons of low precipitation, Helminthoglypta will estivate and form a mucous covering or “door” over the aperture area to retain body moisture, until conditions become favorable for movement and feeding. Microsite conditions also favor areas where calcium is readily available, since land snails and most mollusks require calcium as a nutrient source for shell growth.

Most land snails, including Helminthoglypta species, are foraging generalists and will feed on live and dead material. They are essential in ecosystems as detritivores and decomposers, along with providing a link to ecosystem food chains. In addition, due to limited mobility, home ranges, tend to be very small, only a few acres in some cases (Burke 2013). As a result, microsite conditions may be the most important factor limiting terrestrial snail abundance, since the assemblage of habitat components including access to a substrate of calcareous carbonate (often cliffs habitats or talus slopes), sufficient moisture (even in arid environments), and food consisting of herbaceous materials such as decaying leaf litter are critical for persistence (Burch and Pearce 1990).

The Merced Canyon shoulderband occurs on talus deposits, outcrops and steep slopes where moisture and high humidity are retained on the western foothills of the Sierra Nevada. Forested and woodland habitat with rocks, logs and woody debris are also preferred habitat. This area experiences dry, xeric conditions with less than six inches precipitation annually and as a result, limited moisture that is available is essential for respiration and often hatching of eggs. This species has very little capability to disperse and even relatively small barriers are limiting. Drought and climate changes are threats as well as stochastic events that might affect this single location.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species is found on the Sierra National Forest in the Merced Canyon area, just south of Portal. Four locations are recorded in CNDDB.

Key ecological conditions for this species

Key ecological conditions for this species include talus deposits and outcrops, typically on steep slopes where moisture and high humidity are retained. Other ecological conditions include rocks, logs, vegetation, leaf litter and woody debris in forest habitats.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Although this species has a restricted habitat, rocky outcrop habitat, talus deposits and forested habitats with rocks, logs and woody debris is not limited on the Sierra NF.

The projected status of those ecological conditions relative to the species considered

Connectivity of habitat is important because this species has limited movement capability and is restricted to limited times of the year for movement. The degree of connectivity for dispersal within and between occupied areas depends on the density and arrangement of shaded down wood and other cover objects that provide daily refugia during the wet season (Jordan & Black 2015). Mollusks which inhabit rocky habitats also utilize the surrounding forest areas for foraging and dispersal during moist, cool conditions. Seasonal deep refugia include talus deposits and outcrops, are used for up to half the year (Jordan & Black 2015). These seasonal refugia also provide protection from fire and predation during inactive periods (Duncan 2005b). As fire severity and intervals increase, degradation and loss of habitat for this species will also increase.

Since land snails have limited mobility, poor active dispersal ability, and are very sensitive to desiccation, they are highly vulnerable to fire itself and to subsequent habitat destruction (Burke 1999). In consequence, post-fire return of this group is expected to be slow. According to Burke (1999), intense fire events can result in the persistence of only a small fraction of mollusk fauna for many years (possibly a century or more). Less-severe fires leaving numerous large, minimally charred logs in the stand result in a greater portion of mollusk survival (Burke 1999).

Warming temperatures and longer droughts associated with climate change is expected. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. As a result, microsite conditions on rocky steep slopes that include high humidity and moisture will be impacted (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

As with other species with a limited range, stochastic events are a significant threat to the persistence of this species. Events such as fire, flood, habitat alteration, or climate change can significantly impact a limited range animal. Habitat alteration such as development for mining, road widening or construction and mineral quarrying likely pose the greatest threat to this species. As few studies have investigated this species, additional research needs to be conducted to determine what threats are most significant for this species. In addition, these areas are impacted by invasive plant species, habitat fragmentation, surface mining, post-fire disturbance, intensive grazing, illegal marijuana cultivation, and climate change.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The Merced Canyon shoulderband is primarily restricted to rocky outcrop habitat on the Merced River within Sierra National Forest. The biggest threats to this species on the Sierra NF are degradation or loss of habitat from ground disturbing activities, such as mining, heavy recreation use, and drought. These factors combined with increased stochastic fire events of high intensity, along with climate change, puts the Merced Canyon shoulderband at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Indian Yosemite snail meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Aquatic Insects

An isopod - *Calasellus longus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Channel modification; changes in water quantity or quality; habitat loss; competition and predation from invasive species.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: S1

Other Designations: CA-SGCN

Isopods are one of the most morphologically diverse of all the crustacean groups, ranging from fully terrestrial to marine, and they are also diverse in shape and size, ranging from micrometers to a half meter in length (NOAA 2018). The most common isopod is the "pillbug", a terrestrial isopod species, also known as the wood louse and is found throughout North America. Isopods inhabit a variety of environments from mountains and deserts to the deep sea, and are distributed worldwide, with an estimated 10,000 species in the order Isopoda (NOAA 2018). Isopods are also found in aquatic environments. The genus Calasellus inhabits freshwater environments in California, including lakes, seeps and springs (Graening 2013); although relatively wide-spread throughout California, the species within this genus are highly endemic.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Calasellus longus was discovered in the early 1980s by students from the University of California, Davis (Bowman 1981). This isopod is an endemic species to the Shaver Lake area, located on the Sierra National Forest. Shaver Lake is not a natural body of water, but instead, a reservoir for water power formed by the Shaver Lake dam. Having evolved long before 1927, *C. longus* is native to the aquifer that supplies the spring from which the isopods were collected (Bowman 1981). The original town of Shaver was buried under the lake when the Thomas A. Edison Company purchased and enlarged the lake in 1919 (Durham 1998). The dam was completed in 1927 and crosses the Stevenson Creek tributary, which is in the drainage system of the San Joaquin River.

Key ecological conditions for this species

Key ecological conditions for the *Calasellus longus* are water quality and quantity, including cold water conditions from seeps, springs and lakes.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Warming temperatures can limit distributions of native fishes and other aquatic dependent species, like *Calasellus longus* (USDA 2013). Fish stocking in rivers, streams, reservoirs, and previously fishless lakes can reduce native fish and amphibians. Other aquatic invasive species, such as quagga mussel and New Zealand mudsnails, have spread throughout California on boats, fishing equipment, and other water sports gear (Moyle 2015).

The projected status of those ecological conditions relative to the species considered

Water quantity and quality, including stream morphology and temperatures, may be affected in the future as hydroelectric use continues and increases. The Forest completed a Settlement Agreement with Southern California Edison in 2008 regarding future operations of several of its hydroelectric facilities. Among the conditions on the new licenses would be increases in minimum instream flow, along with channel and riparian maintenance flows. Increases in flow would augment the amount of habitat available, and possibly reduce water temperatures in some stream segments, providing additional cold water habitat.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

As a result of limited distribution, this species is highly susceptible to stochastic events and drying conditions resulting from increasing temperatures, along with events related to climate change. Activities that divert water flow from springs can greatly impact this species. In addition, extremely limited dispersal ability of this species and isolated populations put it at further risk for localized extinctions. Non-native fishes have been introduced or have invaded most waters of the range. These waters include extensive areas that were once fishless at high elevations. Sierra Nevada fisheries have largely shifted from native fishes, especially salmon and other migratory fishes, to introduced fishes (USDA 2013). Predation by non-native, introduced fishes is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) may readily consume *Calasellus longus*. Additionally, predation from introduced American bullfrogs (*Rana catesbiana*) likely impact this species.

Recreation use on the Sierra NF may also pose a risk to *Calasellus longus* and its habitat. Water plays a major role in providing a diverse set of recreation opportunities on the Sierra NF. The San Joaquin River and other areas where habitat exists may be at risk as recreational use increases (USDA 2013).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Calasellus longus is restricted to the Shaver Lake area on the Sierra National Forest. The biggest threats to this species are changes in the persistence or modifications of cool water conditions where this species occurs. These factors combined with direct mortality due to predation, recreation trampling, and stochastic events, including climate change, that affect water temperatures, puts *Calasellus longus* at significant risk. There is substantial concern about this species ability to persist on the planning unit.

Based upon the evidence and supporting best available science, *Calasellus longus* meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Chapter 2 – Rationale for Animal Species Not Meeting Criteria for Species of Conservation Concern

Birds

Barrow's goldeneye - *Bucephala islandica*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

None known in plan area.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S1

Other Designations: CA-SSC/Extirpated (breeding); CA-SGCN

The California wintering population migrates to breeding grounds in Oregon, Washington, western Canada, and Alaska, and is mostly absent from April to September. A very uncommon winter resident (October to March) along the central California coast, mainly in San Francisco Bay and vicinity, and in Marin and Sonoma counties. Considered rare in northwestern California south through Mendocino County; found regularly in southern California only along the Colorado River. Rare and local inland in winter on lacustrine and riverine waters.

Sierra National Forest-Specific Rationale

Historically, Barrow's goldeneyes were observed breeding in the Sierra Nevada but there are no recent nesting records despite extensive systematic and incidental surveys in formerly documented nesting areas. The best available scientific information about the bank swallow does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, Barrow's goldeneye does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Black-backed woodpecker - *Picoides arcticus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Potential threats to the black-backed woodpecker include habitat removal (including post-fire timber harvest), climate change, and lack of habitat due to changing fire regimes or fire suppression (California Fish and Game Commission 2013).

Rationale for Black-backed woodpecker

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S2

Other Designations: None

The black-backed woodpecker has a global rank of G5 (Secure), a California State rank of S2 (Imperiled) (see additional information below regarding the California State rank; CNNDB 2016; 2018), and a Nevada State rank of S1 (ranked for Douglas and Washoe Counties and not on the Inyo NF). This species is a Region 5 Forest Service Management Indicator Species (MIS), representing snags in burned forest.

Black-backed woodpeckers are endemic to North America and occur in boreal regions from south-central Alaska across Canada to Newfoundland and Nova Scotia, and south in the western United States in Montana and Washington through east-central California (AOU 1998, Dixon and Saab 2000). Occasional irruptions occur in eastern North America, south to Illinois, West Virginia, and Delaware (AOU 1998, Dixon and Saab 2000). There are no described subspecies of the black-backed woodpecker, and their morphology does not notably vary throughout their range (Dixon and Saab 2000). However, populations of black-backed woodpeckers in the Cascade and Sierra Nevada Mountains are found to be genetically

distinct from those in the Rocky Mountains, Black Hills of South Dakota, and boreal regions of North America (Pierson et al. 2010).

Based on Breeding Bird Survey (BBS) data, there are an estimated 800,000 black-backed woodpeckers worldwide, with an estimated 5,000 of these birds in California (PIF 2014). However, detection probabilities for this species when performing passive point counts are relatively low making abundance estimations difficult from these types of surveys difficult (Siegel et al. 2010). In 2015, management indicator species (MIS) surveys focused on black-backed woodpeckers found 31 out of 50 randomly selected post-fire areas in the Sierra Nevada Mountains were occupied by black-backed woodpeckers (Siegel et al. 2016). On eBird, they are most commonly reported on the Inyo and Tahoe National Forests (322 and 264 observations respectively).

BBS survey data show a positive, but non-significant increase in black-backed woodpecker abundance in the Sierra Nevada Mountains between 1966 and 2013 (+5.23, 95% CI[0.54, 10.22])(Sauer et al. 2013). However, the credibility of trend estimates made using BBS data is considered low because black-backed woodpecker detections are relatively infrequent with a relative abundance of 0.02 individuals encountered per survey route in the Sierra Nevada (Sauer at al. 2013). Similarly, the detection rate of black-backed woodpeckers during Christmas Bird Counts in California was too low to detect any clear population trends (0.0002 detections per party hour between 1966 and 2015;NAS 2015). MIS surveys conducted between 2009 and 2015 detected no significant trend in black-backed woodpecker populations within burned forests in California. In 2013, the California Department of Fish and Wildlife deemed black-backed woodpecker populations to be stable enough to not warrant listing as a state endangered species, and there is no indication that their range within California has changed since the 1940s (Grinnell and Miller 1944, Small et al. 1994, Bonham 2013).

In January 2016, CDFW released a Special Animals List (California Department of Fish and Wildlife, Special Animals List, January 2016: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline=1) which ranked the black-backed woodpecker as S2 (imperiled). This imperiled ranking appears to be at odds with the May 2013 Fish and Game Commission finding in California that listing the black-backed woodpecker as Threatened or Endangered under CESA was not warranted after a careful year-long review of the species (California Fish and Game Commission 2013). The ranking of the species by CDFW as S2 was based on the records in the CNDDB database. As part of the ranking process CDFW did not consider other data sources when updating their rankings. There were 59 CNDDB records for black-backed woodpeckers which included approximately 24 records from eBird, 19 records from Institute for Bird Populations, 9 records from NRIS (Forest Service database), and 2 records from C. Hanson; however, these are only a fraction of the sightings or records from these sources. Additionally, CNDDB did not include any records that were identified as collected by Point Blue Conservation Science (PBCS). The Forest Service is working with CDFW to update the records for the species to include all the records from Institute for Bird Populations and Point Blue Conservation Science, as well as any other sources. Prior to the CNDDB update, the state rank for the species was S3S4 (Vulnerable to Apparently Secure). The CNDDB list was updated in August 2018 and the California state rank is still S2 (imperiled).

In 2008, the black-backed woodpecker was considered for the California Bird Species of Special Concern (BSSC) list (Shuford and Gardali 2008), but it did not rank high enough to be included on the BSSC list. The black-backed woodpecker was petitioned for listing under the California Endangered Species Act (CESA) (Hanson and Cummings 2010). The California Fish and Game Commission reviewed the petition and found that listing the black-backed woodpecker as Threatened or Endangered under CESA was not

warranted (California Fish and Game Commission 2013). The Commission's conclusion regarding their finding was summarized as follows:

- The lack of an apparent range retraction or changes in distribution within the range.
- The episodic cycles of high density occurrences (i.e., prey invasion, high woodpecker productivity, prey decline, and woodpecker dispersal) and the lack of current data on the cycle's impact on the long-term viability of California's black-backed woodpecker population.
- The lack of data concerning the role of green forest on the species but its apparent use as habitat.
- The trending increase in fire frequency, size, and severity as compared to the early- and mid-20th century.
- Uncertainty regarding the magnitude of the threat posed to black-backed woodpeckers by post-fire salvage logging.
- Lack of logging on approximately 80 percent of severely burnt US Forest Service (USFS) forest habitat since 2003 (i.e., 87,200 acres).
- The ongoing long-term monitoring of the species as an MIS.
- Black-backed woodpecker populations in California are not geographically isolated from populations in adjacent states.

More recently John Muir Project, Center for Biological Diversity, Blue Mountains Biodiversity Project, and others filed a petition (Hanson et al. 2012) to list the Oregon/California and Black Hills (South Dakota) populations of the black-backed woodpecker as Threatened or Endangered under the federal Endangered Species Act. The U.S. Fish and Wildlife Service prepared a 90-day finding indicating that the petitioned action may be warranted based on the information provided by the petitioners; therefore when funds become available, they will initiate a review of the status of the two populations to determine if listing the Oregon Cascades-California population and/or the Black Hills population as either subspecies or Distinct Population Segments is warranted (United States Department of the Interior 2013).

In California, the species is found at middle to higher elevations in inland mountains from the Oregon border to the southern Sierra Nevada (Bond et al. 2012b). The woodpecker occurs at lower abundance in most unburned forest types and is also found in beetle-killed forests, but reaches its greatest abundance in recently (1-8 year-old) burned forests with fire killed trees (Bond et al. 2012b). Home range size is highly influenced by snag basal area and density (Siegel et al. 2014a, Casas 2016). "Black-backed woodpeckers occur at low densities in unburned forests, but because these areas are far more widespread than recently burned (<10 year old) forests, woodpeckers in 'green' forest likely account for a substantial portion of the total population size" (Bond et al. 2012b). Fogg and others (2014) estimated black-backed woodpecker occupancy in green forest and found occupancy was higher than previously understood (0.21). In addition, the authors site colonization and extinction probability in green forest were low (0.05 and 0.19, respectively) and suggest that many of the individuals detected in green forest were not just actively dispersing across the landscape in search of burned areas, but were occupying relatively stable home ranges (Fogg et al. 2014). Black-backed woodpeckers have been documented to forage in green forest (Siegel et al. 2013, Tingley et al. 2014) and sometimes nest in live trees or excavate cavities in dead portions of live trees (Bull et al. 1986, Goggans et al. 1989, Purcell 2010, Bond et al. 2012a). Some research suggests that Black-backed woodpeckers may prefer trees with softer wood for nesting (Lorenz et al. 2015).

Population trends of black-backed woodpeckers are poorly known (Bond et al. 2012b). Monitoring of the black-backed woodpecker across the 10 National Forests in the Sierra Nevada has been conducted in

partnership with the Institute for Bird Populations (IBP) in burned forest habitat. Collectively the monitoring data from burned forests and from unburned "green" forests show that black-backed woodpeckers are not undergoing significant population declines.

In the most recent reporting for the black-backed woodpecker monitoring project, Siegel and others (2016), report "At this time there is no significant evidence of a temporal trend in occupancy rates during the seven years (2009-2015) we have been monitoring black-backed woodpeckers on National Forests in California, or of a broad-scale change in the species' distribution in California. Although there was a two-year decline in point-level occupancy from 2013-2014, resulting in a previously-reported marginal (P = 0.13) negative trend, this trend was no longer apparent in the 2015 surveys. Additionally, the proportion of occupied fires has remained largely constant"(Siegel et al. 2016). A study in the Black Hills of South Dakota (Rota et al. 2014) found population growth rates were positive only in habitat created by summer wildfire. Population growth rates have not been calculated for California.

Roberts et al (2015) detected black-backed woodpeckers at unburned "green" forest transects on all forests in the Sierra Nevada except for Sequoia National Forest and the Lake Tahoe Basin Management Unit. In 2016, Roberts analyzed the 2011-2015 data and revised their previous black-backed woodpecker occupancy estimate from 2014. He found that "Although the occupancy estimates are largely similar to our previous analyses, the pattern among years implies a different interpretation of the trend over time which appears to be stable rather than strongly decreasing as we reported following the 2014 field season" (Roberts and Burnett 2016).

Potential threats to the black-backed woodpecker include climate change and lack of habitat due to changing fire regimes or fire suppression, and habitat removal, including post-fire timber harvest (Siegel et al. 2018).

Climate change is considered a potential threat to the persistence of black-backed woodpeckers. Audubon and Point Blue have both used species distribution models to model the projected future distribution of black-backed woodpeckers based on various future climate projections. The Audubon effort was done at the large scale of the United States and Canada using Breeding Bird Survey (BBS) records and Christmas Bird counts (Distler et al. 2015). However, BBS data from the Sierra Nevada are quite sparse. Bond and others (2012) note, "black-backed woodpecker occurrence data from the Breeding Bird Survey (BBS) are too sparse to make inferences about population trends in the Sierra Nevada. That paucity also makes it difficult to model the distribution of the species in current time or to project in the future (Wiens et al. 2009). The Point Blue modeling effort was focused on the state of California and used a larger number of records to model black-backed woodpecker distributions. Another modeling effort included the use of higher elevation conifer and subalpine conifer forest to model the current and projected future distribution of black-backed woodpeckers (Stralberg and Jongsomjit 2012). These modeling efforts produced future range maps of the species and habitat which can be compared to the current modeled distribution of the species which indicate range contractions, but they did not quantify the amount of range lost.

Gardali and others (2012) used the results of the Point Blue species distribution models, as well as other factors to rank the vulnerability of birds in California. They found that the black-backed woodpecker had a climate vulnerability of 3 which was the lowest priority level (Gardali et al. 2012). Another analysis of Sierra Nevada bird species vulnerability to climate change was conducted and found that future vulnerability of the black-backed woodpecker was "presumed stable" under both climate scenarios that they considered (Siegel et al. 2014a). Siegel and others (2014) included results from the Point Blue species distribution models as one of the factors considered in the rankings.

Fire severity is considered higher today than under pre-settlement conditions, with the average fire in modern mixed-conifer and yellow pine forests on USFS lands supporting 5 to 7 times more area of stand-replacing fire than fires before Euro-American settlement (Miller et al. 2009, Miller and Safford 2012, Malleck et al. 2013, Safford and Stevens in press;*in press*in press). Fire size and fire severity have been trending up in low and mid-elevation forests on USFS lands over the last 20 to 30 years, and these trends have been linked to increasing forest fuels from historical forest management actions, fire suppression, and climate change (Miller et al. 2009, Miller and Safford 2012, Safford et al. 2012, Malleck et al. 2013). Recent fires in the Sierra Nevada have included some huge patches of stand-replacing fire, extending for thousands or even tens-of-thousands of acres. This is in direct contrast to the size of stand-replacing patches from active fire regime forests in reference landscapes of the Sierra Nevada (areas where the fire regime is minimally influenced by humans), where mean stand-replacing patch size is <4 ha and maximum patch size generally is ≤100 ha (Collins and Stephens 2010, Miller and Safford 2012, Safford and Stevens in press). Thus, these trends and predictions indicate an increase in burned forest habitat availability for black-backed woodpeckers into the future (Bond et al. 2012b, Malleck et al. 2013).

Post-fire snag removal treatments commonly referred to as "salvage treatments" have been identified as a potential threat to the persistence of black-backed woodpeckers (Siegel et al. 2018); however, treatments can vary substantially in their duration and intensity on the environment, therefore caution is recommended when discussing results of studies that examine the effects of salvage treatments across the US and Canada on black-backed woodpecker and their habitat (Bond et al. 2012b).

A recent study by Odion and Hanson (2013) suggests that post-fire logging of one third of suitable black-backed woodpecker habitat per year over the next three decades will lead to a trend towards extinction for the species. This publication, (Odion and Hanson 2013) makes a number of flawed assumptions in their analysis methodology:

1. The authors make serious errors in determining tree mortality from stand initiation. The two are related, but are not considered a method for determining mortality of trees. The authors have made the assumption that increases or decreases in stand initiation are resulting solely from fire suppression, and any changes in stand initiation could only be caused by fire. This discounts the effects of insects, disease, stand density, wind, snow, and other variables, all of which may have significant effects on stand initiation.
2. The authors also use a different definition of high severity fire (primary habitat) than the generally accepted definition of ≥50% basal area mortality. They use ≥75% basal area mortality.
3. The authors choose a static time period of 1984-2010 to analyze all fire disturbances and thereby the current rate of formation of primary black-backed woodpecker habitat. By selecting this static time period for their analysis, the authors have drastically underestimated the annual amount of high severity fire occurring across the landscape, thereby underestimating the rate of formation of primary habitat for the black-backed woodpecker. Current science indicates that the total area of high severity burned forest in the Sierra Nevada is not lower than historic reference conditions (Miller and Safford 2012) and the size of high severity burned patches has significantly increased (Miller et al. 2009) [see also, climate change section in this narrative]. The entire western United States has experienced higher large-wildfire frequency, longer wildfire durations, and longer wildfire seasons since the mid-1980's (Westerling et al. 2006).
4. The authors assume that 33% of high severity fire acreage on public lands will be harvested annually. Actual harvest rates vary dramatically from year to year depending on a variety of factors including the number, size and location of fires on NFS lands, but even with an extreme event such as the Rim fire, salvage harvest did not approach 33%. When focusing on the proposed treatments solely for the

year 2014 (an above-average year in which several large fires were being analyzed for treatments including the Rim, American, and Aspen fires) only 8.9% of suitable black-backed woodpecker habitat was proposed for treatment. This is far less than the 33% annual treatment rate assumed by Odion and Hanson (2013).

Siegel and others (2011) conducted surveys for black-backed woodpeckers in 2009 and 2010 across recent fires on national forest lands in California. "Overall, black-backed woodpecker were detected at approximately 20% of unsalvaged stations and 25% of salvaged stations, suggesting that black-backed woodpecker occurrence might not be negatively associated with salvage logging. It is clear that some areas subject to post-fire logging do contain woodpeckers and that post-fire logging does not fully preclude woodpeckers from occupying burned areas. However, since salvage logging is inter-correlated with measures of snag basal area (since snag basal area measurements were taken at the time of survey, post logging), the capacity of the current analysis to detect the full effects of salvage logging on black-backed woodpecker occupancy may be limited" (Siegel et al. 2011). The authors go on to state: "Pilot analyses indicate that after accounting for differences in snag basal area, the status of salvage logging at a survey station may not be a significant determinant of black-backed woodpecker occupancy. Certainly, multiple areas in our study area subject to salvage logging were found to be used by black-backed woodpeckers" (Siegel et al. 2011). This is in contrast to previously published findings (Hanson and North 2008).

Results from radio-telemetry studies indicate that black-backed woodpecker avoid foraging in areas where most of the snags had been removed in post-fire forest in California (Siegel et al. 2012). A subsequent study found that while there was a general absence of foraging locations within salvaged areas, the presence of salvage logged stands within a fire area does not preclude use of adjacent remaining stands by black-backed woodpecker (Siegel et al. 2013). It fact, radio tracking data obtained from three recent fires in California documented four birds nesting and foraging adjacent to large blocks of salvage harvested areas in their home ranges, and two birds foraging almost exclusively in unburned green forest adjacent to the fire.

The Forest Service tracks the amount of black-backed woodpecker burned forest habitat, as well as the fraction of this habitat that has been removed in a regional analyses. In April 2014, a regional analysis was conducted for black-backed woodpecker across the range of the black-backed woodpecker in California, analyzing treatment of suitable burned black-backed woodpecker habitat across all lands, including the 10 Sierra Nevada forests from 2006 to 2013. This regional analysis determined that on Forest Service lands across the Sierra Nevada bioregion, 21% of the acres that burned from 2006 to 2013 and are suitable for black-backed woodpeckers have been, or were proposed to be treated with post-fire timber removal. This analysis indicates that on average, only 2.6% of suitable black-backed woodpecker habitat was treated per year on National Forest System lands throughout the Sierra Nevada bioregion for the time period analyzed.

Salvage logging is not proposed on all fires and salvage logging is not completed on all fires where it has been proposed. These analyses confirm that spatial and temporally ephemeral nature of black-backed woodpecker burned forest habitat and do not indicate that burned forest habitat is not available for the species. It is expected that the total amount of habitat (and fraction removed) are going to fluctuate annually; therefore, we do not consider the amount of burned forest habitat to be a limiting factor.

We do not consider climate change, changed fire regimes, and salvage treatments threats to the persistence of black-backed woodpeckers within the plan area, even when considered cumulatively based on the BASI considered. It appears that black-backed woodpeckers in the Sierra Nevada have the ability to persist sustainably in certain green forest habitats, while being adapted to opportunistically exploit ephemeral habitats that are rich in prey such as beetle killed stands and high to moderate severity fire

areas. Despite the local effects of past and present fire effects and climate change (even if you include salvage treatments), the upper montane forests within the Sierra Nevada are still considered within the natural range of variability, a sound proxy for considering ecosystem health and resiliency.

Sierra National Forest-Specific Rationale

Information on current distribution of the species on the planning unit

The Sierra National Forest occurs near the most southern boundary of black-backed woodpecker range and surveys conducted by Point Blue Bird Observatory have regularly detected black backed woodpeckers in low numbers around the vicinity of Shaver Lake, Huntington Lake, Dinkey Creek, San Joaquin River, and Mono Hot Springs (California Avian Data Center, 2009-2016 survey data). The Institute for Bird Populations has been monitoring black-backed woodpeckers across the Sierra Nevada in recently burned forest (2009-2016). On the Sierra NF birds have been detected in the French, Aspen, and Bear fire areas[4].

In eBird (2017), there were 104 entries with 189 individuals observed within Forest boundary, and 258 entries of 408 individuals within Forest plus a 5 mile buffer. In CNDDB there are 6 entries within the Forest and 9 within the Forest plus a 5 mile buffer. In NRIS, there are 35 entries of 40 individuals within the Forest and 36 entries with 41 individuals within Forest plus a 5 mile buffer.

Key ecological conditions for this species (see above for additional information)

Abundant snags with abundant insect prey (wood boring beetles) and severely burned older conifer forest are key habitat needs for this species. Current Sierra National Forest vegetation types as defined by CWHR indicate forest types (with acreages in parentheses) on the Sierra NF containing potential habitat for Black-backed woodpecker include:

Jeffrey Pine (28,585), Lodgepole Pine (32,168), Red fir (141,303), Sierran Mixed Conifer (269,921), Subalpine Conifer (179,348), ponderosa pine (73,574), and white fir (2,556).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

The forest assessment for the Sierra, notes that the number of large trees and snags are low and highly variable across all forest types. In all conifer types, there is less than 5 large trees (less than 30 inch diameter) per acre. In addition, the densities vary radically across the landscape as large trees are not evenly distributed. Most areas have a few large trees per acre and some patches, often previously disturbed (timber harvest or wildfire), have none or they are unevenly distributed across the landscape. Very large tree (trees > 40” dbh) densities are typically less than one to two trees per acre. Again, many areas are devoid of large trees. In conifer-hardwood forests, large tree levels are also somewhat low, with trees < 24” dbh ranging from 4 to 6 per acre. Large snags show similar patterns to large trees, but with lower densities and higher variation. Calculations of snags greater than 15 inches diameter show the range is from 1 to 4 snags per acre in conifer forests. As with large trees, the numbers are lower for conifer-hardwood, generally less than 3 snags per acre and numbers are calculated to be even lower in the oak woodland. Snags are especially variable in distribution with some patches containing large numbers from recent wildfires or where insects or disease killed groups of trees and other areas containing few dead trees. Large snags can stand for longer periods of time (decades) than smaller diameter snags (often less than a decade).

[4] http://www.birdpop.org/pages/blackBackedWoodpeckerMap.php

The Sierra National Forest has incurred tree mortality from epidemic infestations of western pine beetle in recent years (USFS 2017). Approximately 1/3 of the Forest has died and it continues to move up in elevation. The majority of the ponderosa pine belt has died. Bark beetles have created areas with dead trees greater than 10" DBH. Moderate and dense tree cover is mostly heavily affected by drought induced insect mortality. The most affected areas are found at elevations below 6,000 feet. Portions of the Sierra NF have lost 15-40 trees per acre and some smaller areas greater than 40 trees/acre as a result of drought related mortality. A discussion, including a table and map summarizing mortality and estimated dead trees from 2014-2017 aerial detection surveys, is provided in the Northern Goshawk rationale. The latest map can be viewed at https://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fseprd550891.

As of the 2017 overflights, mortality is becoming more evident at the higher elevations, primarily in white and red fir, as compared to previous years where most of the extensive mortality was observed in lower elevation pine and mixed conifer forests. Mortality in the low elevation pine of the southern Sierra Nevada range is greatly reduced due to lack of viable host and more normal precipitation conditions. However, low elevation pine mortality elsewhere is common.

The projected status of those ecological conditions relative to the species considered

In general, large scale uncharacteristically severe wildfire are expected to increase in frequency and intensity with increased bark beetle outbreaks. Depending on burn severity, these events have the potential to both create and destroy habitat for woodpeckers.

The following estimates show projected trend (2012-2032) for each forest type potentially used by Black-backed woodpecker. Approximate percentage of each habitat type on the Sierra NF are in parentheses.

Coniferous Forest, Early Seral (3.4): Decreasing trend most likely due to fire suppression, salvage logging, and natural succession shifting forests into mid-seral condition.

Coniferous Forest, Complex Early Seral (Unknown): Decreasing trend due to past fire suppression, salvage logging, reforestation (by humans), and mechanical thinning.

Coniferous Forest, Mid Seral (19.9): Gradual decreasing trend. Major loses are projected if large scale, high intensity fires occur in these forests due to high fuel loads.

Coniferous Forest, Late Seral, Closed Canopy (11.5): Gradual increasing trend as the large amounts of mid-seral stands progress into late-seral forests. The continued management framework would retain nearly all trees >30 inches dbh, thus increasing the number of stems per acre.

Coniferous Forest, Late Seral, Open Canopy (0.2): This small amount of habitat is predicted to remain stable although possibly increasing as a result of closed canopy forests shifting into open canopy forests as a result of potentially increased mortality.

Overall, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. Moisture stress and the frequency and severity of bark beetle outbreaks are projected to increase dramatically with increasing temperatures in the Sierra Nevada, resulting in widespread tree mortality (Bentz et al. 2010, Hicke et al. 2006). This is currently happening on much of the Sierra and Sequoia National Forests in ponderosa pine and lower elevation mixed conifer forests, where the amount of dying conifers is moderate to very high in many areas. These levels are greater than what has occurred in the last 50 years.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Fire Suppression

Areas with high densities of burned snags created by fire are important for black-backed woodpecker and other species dependent on complex early seral forests. Due to fire suppression, there may be fewer total patches of snags created from fire across the landscape.

Salvage logging

Black-backed woodpeckers are irruptive species and opportunistically forage on beetle infested trees. Post-fire timber harvest, particularly right after a fire when woodpeckers move into an area can remove important foraging habitat. Salvage logging has not occurred in recent years and is not needed in areas where disturbances create complex early seral habitat for wildlife (See chapter 8 in the Living Assessment).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Based on several factors, including the black-backed woodpecker's wide range across the Sierra Nevada and Cascades; no detectable decline in California; no limiting habitat factors within the plan area; the potential for continued favorable habitat creation from wildfires and bark beetle outbreaks, and other forest insect and disease activity; and numerous detections within the Sierra NF plan area, the best available scientific information about the black-backed woodpecker does not indicate substantial concern about the species' capability to persist over the long term in the plan area. *Based upon the lack of evidence and supporting best available science, the black-backed woodpecker doesn't meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.*

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Calliope hummingbird - *Selasphorus calliope*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No known threats in plan area.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: USFWS-BCC

Calliope hummingbirds make annual migrations from central Canada to southern Mexico, making them the smallest long-distance migrants of any bird (Beedy and Pandolfino 2013). They arrive in the Sierra Nevada by mid-April; most males depart by early July for their wintering gournds; the females and young follow later and are mostly gone by mid-August. They are considered to be fairly common nesters in the lower and upper conifer zones, the only hummers that reularly breed above the foothills. Postbreeding bireds move upslope to the subalpine and alpine zones in July and early August.

Sierra National Forest-Specific Rationale

There are many reported sightings of Calliope hummingbirds in eBird in the plan area. There is no evidence for substantial concern on the planning unit; no known local threats and no local concerns.

Best Available Scientific Information Considered

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Cassin's finch - *Carpodacus cassinii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No threats identified on this planning unit

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: USFWS Bird of Conservation Concern

Cassin's finches are considered common breeders in open lodgepole pine forests of the subalpine zone, and fairly common in red fir and mixed conifer forests of the upper conifer zone (Beedy and Pandolfino 2013). They are considered general uncommon to rare below 5,000 feet elevation. Cassin's finches feed on conifer buds on the highest branches, and seeds on grassy forest floors, in clearings, and along the edges of meadows. They breed in mid-elevation forests on the west side of the Sierra Nevada.

Sierra National Forest-Specific Rationale

There are many reported sightings of Cassin's finches in eBird in the plan area. There is no evidence for substantial concern on the planning unit; no known local threats and no local concerns.

Best Available Scientific Information Considered

Beedy, E. and E.R. Pandolfino. Illustrated by Keith Hansen. 2013. Birds of the Sierra Nevada: Their Natural History, Status, and Distribution. University of California Press, Berkeley, CA. 430 pp.

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Flammulated owl - *Psiloscops flammeolus* (*Otus flammeolus*)

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Habitat threatened by altered fire regimes, elimination of large trees/snags, and climate change.

Rationale for flammulated owl

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S2S4

Other Designations: USFWS-BCC

The flammulated owl has a global ranking of G4, Apparently Secure which is defined as "uncommon but not rare; some cause for long-term concern due to declines or other factors". The ranking of S2S4 in California indicates a range of uncertainty about its status in the State which lies between Imperiled: "imperiled in the state because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the state" and Apparently Secure (NatureServe 2015c). This species is also a USFWS bird of conservation concern.

The flammulated owl breeds in montane forests throughout western North America from British Columbia south through central Mexico and migrates to winter as far south as El Salvador and Honduras (American Ornithologists' Union 1998, McCallum 2013b). Population trends are unknown, however within suitable habitat, flammulated owls are considered fairly common as a breeding species in California (Garrett and Dunn 1981, Small 1994, Bezener and Fix 2000, Floyd 2007, Steel et al. 2012). While once believed to be rare, call-response surveys revealed flammulated owls are locally common in quality habitat and among the most abundant birds of prey in some areas (McCallum 1994). Their fairly common abundance is reflected in the numerous and widespread observations of this species in the eBird database (eBird 2016).

Few detections of flammulated owl are expected as no surveys are done specific to this species. In eBird, there is only 1 record of 1 individual on the Inyo and within 5 miles and including the forest, there are 6 records of 6 individuals. In Biodiversity Information Serving Our Nation (BISON) database, there are a dozen or so museum records including records from the 2000's.

Flammulated owls use a variety of forest types during the breeding season, and prefer open to semi-open stands with larger diameter trees (>50 cm, 20 in) on slopes or ridges (Bull et al. 1990, Reynolds and Linkhart 1992, Linkhart and Reynolds 1997, McCallum 2013a, Scholer et al. 2014). In California, flammulated owls nest in a variety of habitats including ponderosa pine, Jeffrey pine, Douglas fir and red fir forests and also black oak stands (Verner and Boss 1980). They prefer low to intermediate canopy coverage; and are particularly common in suitable ponderosa pine forests (Verner and Boss 1980). They

commonly select nest sites in open forests with sparse understory, although they will persist on territories where the understory has become denser (McCallum and Gehlbach 1988, McCallum 2013a).

Altered fire regimes can affect habitat suitability. Fire suppression can promote a dense understory which is unfavorable for foraging and may also increase the risk of large, high-severity fires which can eliminate mature conifer forests needed by flammulated owls (Raphael et al. 1987, McCallum 1994). Forest management activities that remove large trees and snags may also affect flammulated owl populations by eliminating suitable nest sites (Franzreb and Ohmart 1978, Raphael and White 1984). Climate change is also a threat, especially if it were to drastically alter habitat availability and forest structure through altered fire regimes, increased temperatures and more severe droughts (Lenihan et al. 2003, Franco et al. 2006, Barbero et al. 2015, Diffenbaugh et al. 2015).
In summary, the flammulated owl is fairly common throughout its range. And while it does face some stressors in the form of climate change and altered fire regimes, suitable habitat is expected to persist. The impact that climate change may have on montane forested habitats in the future is unclear. It is also unclear what if any effect climate change would have on flammulated owl populations. While flammulated owls prefer open stands with large trees, they breed in a wide range of forest conditions including a range of elevations, tree species, and tree sizes. Suitable forested conditions and available snags for nesting are expected to persist even under altered fire regimes.

Sierra National Forest-Specific Rationale

Sightings reported in eBird include several in the Iron and Chowohilla Mountains area, and a few in the areas of Dinkey Creek and Shaver Lake. The best available scientific information about the flammulated owl does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the flammulated owl does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Golden eagle - *Aquila chrysaetos*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Mortality from collisions at wind-energy facilities. Some habitat concerns especially near urban areas.

Rationale for golden eagle

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S3

Other Designations: CDFW-Fully Protected; USFWS-BCC

The golden eagle has a global rank of G5 (secure) and a California state rank of S3 (vulnerable) (NatureServe 2015c). The golden eagle is a fully protected by CDFW and is a USFWS Bird of Conservation Concern.

The golden eagle is a Holarctic species (found throughout all the northern continents of the world), and the North American subspecies (*Aquila chrysaetos canadensis*) breeds regularly throughout the western United States and Canada and across north-central Mexico. Breeding pairs are occasionally reported in mountainous regions of eastern North America. Golden eagles occur throughout the continent during migration, but winter primarily in the west (Kochert et al. 2002, Wheeler 2003). The golden eagle is found on all National Forests in California.

Long-term population trends throughout North America indicate generally stable populations from 1968-2010 (increasing 0.40% per year) (Millsap et al. 2013). Populations in California have also been generally stable. Breeding Bird Survey (BBS) data from California indicate a small, non-significant decline from 1966-2013 (-0.47% per year, 97.5% CI [-1.69, 0.71]) and from 2003-2013 (-0.28% per year, 97.5 CI [-2.82, 2.32]) (Sauer et al. 2014). Christmas Bird Count (CBC) data indicate a slight and non-significant increase (+0.7% per year) in California between 1966 and 2013 (Soykan et al. 2016). However, BBS and CBC data are not the most reliable for this species. BBS routes follow roads and golden eagles generally nest in remote areas. CBC surveys may also have large variation due to the low number of golden eagles counted on each survey, inconsistencies among years in survey effort and area surveyed, and the fact that most surveys are in suburban, exurban, or rural settings where golden eagles are less likely to occur (Kochert et al. 2002).

Despite their generally stable population in California, some areas have seen declines. Population size dropped by over 50% in San Diego County during the 20th century, attributed to loss of habitat caused by urbanization (Kochert et al. 2002). Numbers may be declining in the northwestern portion of the state; however, numbers observed on migration counts and Christmas Bird Counts in the San Francisco Bay Area showed inter-annual fluctuation between 1987 and 2007 but no apparent trends (Golden Gate Raptor

Observatory 2008), and breeding occupancy remained stable in foothills near Livermore from 2000 to 2005 (Hunt and Hunt 2006).

Within eBird, there are 500 records of 632 individuals within the Forest, and within 5 miles of and including the Forest, there are 1348 records or 1658 individuals. In CNDDB, within 5 miles and including the Forest, there are 2 records.

Golden Eagles use a wide variety of habitat for breeding territories including tundra, shrubland, grassland, woodland-brushlands, coniferous forest, farmland, riparian areas, and desert at elevations ranging from near sea level to over 3,600 m (11,800 ft) (Kochert et al. 2002). Although they do nest in grasslands and agricultural areas, breeding birds have been shown to prefer foraging in scrubland over more open habitats (Marzluff et al. 1997, Domenech et al. 2015). Most nests are placed on cliffs, but eagles may also nest on any tall structure, natural or man-made (Kochert et al. 2002).

Golden eagles winter in open habitats such as prairies, shrub-steppe deserts, open grasslands, and agricultural areas (Kochert et al. 2002). In California, their main prey items are ground squirrels and jackrabbits (Carnie 1954).

Golden Eagles are a partial migrant, with both migratory and sedentary populations occurring across their range (Kochert et al. 2002). Eagles breeding in California tend to remain on their territories year-round, but in winter there is an influx of birds that breed outside of the state (Small 1994). Adults are generally faithful to both breeding and wintering sites, while juveniles have a much greater propensity for dispersal (Kochert et al. 2002). Juvenile golden eagles are observed to disperse in all directions, and to explore large areas for dispersal. Resident juvenile eagles can explore an area of between 2000 to 15000 km² (772 to 5790 mi²) and range up to 58 to 184 km (36 to 114 mi) from where they fledged during their first year (Steenhof et al. 1984).

Much of the habitat used by golden eagles is relatively remote so many populations remain unaffected by human influence (Kochert et al. 2002). However, increased urbanization and recreational activities such as rock climbing in California are likely causing disturbance in the vicinity of many nest sites, which decreases productivity (Thelander 1974, Kochert et al. 2002, United States Department of Agriculture 2007). Human disturbance or activity may cause eagles to abandon a nest, render a nest site less productive, or prevent a suitable nest site from being utilized, but direct disturbance of nests appears to be infrequent (Great Basin Bird Observatory 2010).

Wind power development also poses a threat to golden eagle populations. A study of bald and golden eagles at 32 wind energy facilities in 10 states from 1997-2012 found that golden eagles represented 92.9% of eagle mortalities (Pagel et al. 2013), suggesting that they may be particularly susceptible to wind turbines. Survivorship in California near one wind farm varied by age from 79% to 91% with younger birds more likely to be killed by turbines (Hunt 2002). Forty to one hundred eagles are estimated to be killed annually by wind turbines at Altamont Pass near Livermore, California (Hunt and Hunt 2006), and increased demand for wind energy will likely result in higher rates of mortality.

Fires, especially large fires affecting areas >40,000 ha, can adversely affect golden eagle success by reducing prey populations (Kochert et al. 1999). Fires in shrub-steppe communities that remove sagebrush and other shrubs, and replace them with predominately cheatgrass, reduce prey populations and golden eagle nesting success for up to ten years (Kochert et al. 1999). It is unclear if large fires in other habitat types result in similar effects to prey and golden eagle nesting success.

Agricultural development also has negative impacts on eagle populations (Kochert et al. 2002). Shooting, trapping, and the effects of pesticides were severe through much of the 20th century, but these stressors appear to be waning (Kochert et al. 2002, United States Department of Agriculture 2007). Although no longer directly hunted, golden eagles continue to be exposed to lead from ingesting lead shot and fishing tackle from the remains of carcasses left behind by hunters and fishermen (Haig et al. 2014).

In summary, the golden eagle has a broad distribution in the northern hemisphere and in California, they use a broad range of habitats, they possess excellent dispersal capabilities, and their population and habitat trends are generally stable. Remaining threats and limiting factors are largely a concern on non-Forest System lands. Effects from recreational activities and associated disturbance may be a concern at certain nest locations, yet populations have remained stable despite these activities. Effects from fire are applicable to populations in shrub-steppe communities and may be applicable to other habitat types, however effects are not permanent, and nesting success returns to pre-fire levels after approximately ten years.

Sierra National Forest-specific Rationale

Golden eagles within the Sierra NF plan area are uncommon. There are many sighting records in eBird, including around Shaver and Wishon Lakes. The best available scientific information about the golden eagle does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the golden eagle does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Gray-crowned rosy finch - *Leucosticte tephrocotis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No known threats in plan area.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: CA-SGCN

Gray-crowned rosy-finch's are considered to be residents of only the highest mountain peaks, from northern Alaska south to the southern Sierra Nevada and Rocky Mountains; fairly common to uncommon residents of the alpine zone from Sierra County south to Tulare County (Beedy and Pandolfino 2013). More common on the east side compared to the west side of the Sierra Nevada.

Sierra National Forest-Specific Rationale

There are a few sightings of the gray-crowned rosy-finch in eBird, including a January 2018 sighting of a flock of approximately 120 birds. There is no evidence for substantial concern on the planning unit; no known local threats and no local concerns. Based upon the lack of evidence and supporting best available science, the golden eagle does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Green-tailed towhee - *Pipilo chlorurus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No known threats in plan area.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNRB

Other Designations: USFWS-BCC

Green-tailed towhees breed in the wetern United States and most winter in Mexico (Beedy and Pandolfino 2013). They arrive in the Sierra Nevada in low elevation forests in April and migrate to breeding areas in higher elevation forests. Although more numerous and widesptread in breeding areas in east side habitats, many are found in mountain chaparral on the west side, typically above 6000 feet elevation.

Sierra National Forest-Specific Rationale

There are many reported sightings of green-tailed towhee in eBird in the plan area. There is no evidence for substantial concern on the planning unit; no known local threats and no local concerns. Based upon the lack of evidence and supporting best available science, the golden eagle does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Beedy, E. and E.R. Pandolfino. Illustrated by Keith Hansen. 2013. Birds of the Sierra Nevada: Their Natural History, Status, and Distribution. University of California Press, Berkeley, CA. 430 pp.

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Lewis' woodpecker - *Melanerpes lewis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No known threats in plan area.

Rationale for Species

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S4

Other Designations: USFWS BCC; CA SSC; CA SGCN

Lewis's woodpeckers have a global rank of G4 (Apparently Secure), a California State rank of S4 (Apparently Secure), and are recognized as a Bird of Conservation Concern by USFWS.

The Lewis's Woodpecker breeds primarily in medium-to-high-elevation open-forest habitats of the northern half of California and are considered uncommon to fairly common. Breeding Bird Survey and Christmas Bird Count data show a nonsignificant negative trend from 1966 to 2013 ranging from 2.07%-3.32% per year.

Lewis's woodpeckers breed in open canopy forested habitats including ponderosa pine, open riparian woodland, and logged or burned pine forest, with a shrub understory that provides downed woody debris and abundant insects. They typically nest in large diameter trees (~52 cm). Lewis's woodpeckers overwinter in oak woodlands and orchards, as well as other forested habitats.

Threats including historic habitat loss from urbanization and agricultural conversion are not considered relevant threats to Lewis's woodpeckers on National Forest System lands. Potential relevant threats to the Lewis's woodpecker include livestock grazing and fire suppression.

Historic loss of wildlife habitat from intensive livestock grazing is well documented (Bunn et al. 2007a). General threats from livestock grazing include altered vegetative structure and composition, as well as reduced recruitment of seedlings including aspen and oaks from either direct livestock consumption or soil compaction (Bunn et al. 2007a). Livestock grazing did not result in negative impacts to Lewis's woodpecker nest success (Newlon and Saab 2011). Empirical evidence quantifying effects of grazing on the Lewis's woodpecker is lacking. Based on what is known, livestock grazing is not considered a limiting factor for Lewis's woodpeckers within the plan area.

Fire suppression has been identified by some as a potential threat because it may reduce the creation and availability of burned forest which is considered highly suitable nesting habitat for the Lewis's woodpecker (Saab and Vierling 2001). Conversely, data indicates fire size and severity have been trending up in low and mid-elevation forests on National Forest System (NFS) lands over the last 20 to 30 years; these trends have been linked to climate change and increasing forest fuels from historic forest management such as fire suppression (Miller et al. 2009, Miller and Safford 2012, Safford et al. 2012, Malleck et al. 2013). Because Lewis's woodpeckers use burned forest, salvage logging may also be

considered a threat. Some forms of salvage logging in burned forests may be unfavorable for the Lewis's woodpecker, but partially salvage logged forest retaining 50% or more of snags >23 cm had higher bird abundances than unlogged burned forests. Tracking of salvage operations on NFS lands in Region 5 show that only about 2.6% of burned habitat (greater than 50% basal area mortality) is actually salvaged any given year, although this is known to fluctuate annually.

Sierra National Forest-Specific Rationale

Lewis's woodpeckers nest in the interior Coast Range but not in similar habitats in the foothills of the western Sierra (Beedy and Pandolfino 2013). They are fairly common nesters east of the crest, in open stands of ponderosa pine with a shrub component. Lewis's woodpeckers migrate across the Sierra Nevada between breeding grounds and their wintering grounds in the west side foothills. Wintering populations may swell in years when acorns are abundant. Fire suppression and the availability of burned forest habitat are not considered limiting factors for the Lewis's woodpecker within the plan area. The best available scientific information about the Lewis's woodpecker does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the **Lewis's woodpecker doesn't meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

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Mount Pinos Sooty grouse - *Dendragapus fuliginosus howardi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Threats include hunting, incompatible timber harvest, fire suppression and altered fire regime, livestock grazing, land development, recreational use of habitat and climate change.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T1T2

NatureServe State Rank: S2S3

Other Designations: CA Species of Special Concern, CA Species of Greatest Conservation Need

At the species level, sooty grouse (*Dendragapus fuliginosus*) is dispersed throughout coastal northern California and Sierra Nevada. Although subspecies of *D. fuliginosus* are not identified in eBird; the majority of sightings are thought to be the subspecies *D. f. sierrae*.

The Mt. Pinos sooty grouse, *Dendragapus fuliginosus howardi*, is considered one of three subspecies of sooty grouse in California, restricted to the southern Sierra Nevada, south of Kings Canyon National Park, including the Piute Mountains and Tehachapi Mountains (Beedy and Pandolfino 2013). The historical range of *D. f. howardi* is believed to have included parts of the Los Padres, Inyo and Sequoia National Forests; distributed in the southern Sierra Nevada south of Kings Canyon, Piute Mountains, Tehachapi Mountains, Mount Pinos/Mount Able (Cerro Noroestre) area, and Frazier Mountain in southern Califronia (Willet 1933, Grinnell and Miller 1944). The CNDDB database contains two records for the subspecies: four birds found on the Los Padres NF in 1931; and six birds on Sequoia NF in May 2004. Surveys over the past century indicate the range of Mt. Pinos Sooty Grouse receded roughly 100 miles and recent data suggest that the northward decline is continuing (Bland 2013). Sooty grouse have not been found in the southern portion of this range (i.e., isolated mountain habitats) since the early 1990s, with rare reports from south of the Tulare-Kern county line (Bland 2008). Bland (2008) suggests that sooty grouse observed south of Tulare County in recent decades may have been birds dispersing from a Sierra Nevada source, rather than members of a resident breeding population. Currently, the southernmost known breeding locations are at Sunday Peak in south-central Tulare County and Sherman Peak in southeastern Tulare County (Bland 2008). Records for the White Mountains, Mono County, were once provisionally presumed to be *D. f. howardi*, but have since been considered *D. f. sierrae*. However, recent unpublished studies by G. Barrowclough of the mtDNA control region (i.e., cited in Natureserve) suggest Mt. Pinos sooty grouse may be restricted to a smaller area and represent a distinct (and extinct) species; further genetic study is needed to determine if Mt. Pinos sooty grouse is in fact a distinct subspecies.

Sooty grouse are associated with upper elevation fir forests that may be affected by vegetation management and climate change. In early spring, sooty grouse congregate in open mature stands of conifers near the crests of ridges. These “hooting sites,” or “spring activity centers” are traditional, and are returned to year after year, generation after generation. Loss of large trees from these areas are detrimental to grouse. In late spring and summer through fall, females and their young are associated with meadows and other mesic areas. In winter, sooty grouse seek dense conifer stands at high elevations where they subsist almost entirely on fir needles. Sooty grouse is hunted in Fresno and Tulare Counties.

California Department of Fish and Wildlife allow hunting on sooty grouse within both Inyo and Mono counties with a daily take of 2 birds, and a maximum possession of 6 birds (California DFW 2017 Regulations).

Sierra National Forest-Specific Rationale

Dendragapus fuliginosus howardi use is not known to occur in the plan area, since it is north of the species restricted range. Based upon the lack of evidence and supporting best available science, the

golden eagle does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Olive-sided flycatcher - *Contopus cooperi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Potential threats to the olive-sided flycatcher include use of logged and recently burned forest habitat, which is considered a potential ecological trap.

Rationale for Olive-sided flycatcher

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S4

Other Designations: CA-SSC; CA-SGCN; USFWS-BCC

The olive-sided flycatcher has a global rank of G4 (Apparently Secure), a California State rank of S4 (Apparently Secure), and is recognized as a Species of Special Concern and Species of Greatest Conservation Need by CDFW and a Bird of Conservation Concern by USFWS.

Olive-sided Flycatchers breed across Canada and throughout western North America and migrates to winter in Central and South America (AOU 1998, Altman and Sallabanks 2000). In California, they breed throughout northern California, especially along the coast and in the Sierra Nevada Mountains. They also nest in scattered high-elevation areas in southern California.

Olive-sided Flycatchers are considered uncommon to locally common as a breeding species and migrant in California (Garrett and Dunn 1981, Small 1994, Fix and Bezener 2000, Floyd et al. 2007, Widdowson 2008). However, as Grinnell and Miller noted (1944), they are highly conspicuous, and they are likely to be over represented in some surveys. Analyses of Breeding Bird Survey (BBS) data provide an estimate of 1,700,000 total Olive-sided Flycatchers worldwide (PIF 2013). BBS data indicate that California has the highest abundance of Olive-sided Flycatchers across its range with approximately 100,000 individuals within the state (PIF 2013). Although they are not recorded in the CNDDB database, they are commonly reported on eBird in all Forests within the USFS region 5.

Breeding Bird Survey data indicate a significant decrease in Olive-sided Flycatcher populations between 1966 and 2013 with a 2.94% annual decline in California (95% CI[-3.53, -2.37]) and a 3.48% annual decline across the entire BBS survey area (95% CI[-4.64, -2.84]]; Sauer et al. 2014). A study analyzing data from point count areas across the northeastern United States also detected a significant decline in that region (Ralston et al. 2015). Local extirpations from the southern Sierra Nevada have also been documented, despite no apparent change in habitat type and structure in those areas (Marshall 1988).

Olive-sided Flycatchers are associated with open canopy conifer forests and prefer forest edges adjacent to open areas with early-successional characteristics that provide high, exposed perches from which to hunt insects such as bees and wasps. Habitats used include burned forests and unburned logged or naturally occurring open forest habitat. Although there has been an increase in the availability of logged open forest since the 1800's, this may not provide high quality breeding habitat. However, the increase in forest fires has increased the availability of burned forest habitat, which is considered higher quality breeding habitat several years post fire. Extensive deforestation on wintering grounds in the Andes has resulted in widespread habitat loss.

Threats to the persistence of the olive-sided flycatcher include widespread deforestation on wintering grounds Central and South America and the use of logged and recently burned forests, although the understanding of these threats is limited. Despite high densities of Olive-sided Flycatchers occurring in

logged forests, studies have found that compared with other types of habitats, including naturally burned forests, nesting success and survival rates are lower. Logged areas are documented to have higher predation rates. At least one study has also observed that the nesting success of flycatchers breeding in recently burned forests decreased relative to those breeding in unburned areas with similar habitat structure, although sample sizes for this study were small.

It has been hypothesized that although fire may initially reduce reproductive success in this species, they still require older burned forests or a more natural fire regime. Greater nesting success was documented in burned habitats relative to unburned habitats in a forest nine years post-fire. Some suggest that ongoing fire suppression and post-fire salvage logging may also be threats to Olive-sided Flycatchers; however, fire size and severity have been trending up in low and mid-elevation forests on USFS lands over the last 20 to 30 years, and these trends have been linked to increasing forest fuels from historical forest management actions, fire suppression, and climate change (Miller et al. 2009, Miller and Safford 2012, Safford et al. 2012, Malleck et al. 2013). Tracking of salvage operations on National Forest System lands in Region 5 show that only about 2.6% of burned habitat (greater than 50% basal area mortality) is actually salvaged any given year, although this is known to fluctuate annually. Thus, the availability of higher quality breeding habitat is not considered a limiting factor for this species.

Adult survival is often high on their breeding grounds, thus declines in Olive-sided Flycatcher populations may in fact be driven by habitat loss and degradation taking place on their wintering grounds in Central and South America (Marshall 1988, Widdowson 2008, Altman and Sallabanks 2012); however, no study has yet to directly address this hypothesis.

While the olive-sided flycatcher is experiencing population declines, it is unknown whether the threat is on their breeding or wintering grounds. Suitable breeding habitat is available within the plan area and is not considered a limiting factor to the persistence of this species.

Sierra National Forest Rationale

In eBird, there are 506 records of 864 individuals on the Sierra NF; within 5 miles of and including the Forest, there are 987 records of 1585 individuals. There are no records in CNDDB for the Sierra NF. In the Biodiversity Information serving Our Nation (BISON) database, olive-sided flycatcher locations are common and well distributed across the range of the forest plan area. The best available scientific information about the olive-sided flycatcher does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the **olive-sided flycatcher doesn't meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Summer tanager - *Piranga rubra*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Threats to the persistence of summer tanager include loss and degradation of mature riparian habitat dominated by cottonwoods and willows.

Rationale for summer tanager

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S1

Other Designations: CA-SSC; CA-SGCN

The summer tanager has a global rank of G5, a California state rank of S1. In California, it is also recognized as a Species of Special Concern and a Species of Greatest Conservation Need by CDFW.

The summer tanager has three recognized subspecies occurring in central and eastern North America, east-central Arizona, and elsewhere in southwestern North America (Robinson 1996). The southwestern subspecies (*P. r. cooperi*) breeds locally in California and southern Nevada, primarily along the Colorado River but also in very isolated riparian patches west and north to Santa Barbara, Kern, and Inyo counties (Grinnell and Miller 1944, Unitt 2008), and in the southern tip of Nevada (Floyd et al. 2007).

Summer tanager is currently regarded as a rare to locally uncommon species in California (Small 1994). Extensive surveys for breeding summer tanagers during the 1980s-2000s estimated a total known breeding population of only about 100 pairs for the state of California (Unitt 2008).

Summer tanagers in California are split into two breeding groups that are undergoing substantially different population trends (Unitt 2008). Along the Colorado River bordering Arizona the species was regarded as "common" prior to the 1940s (Grinnell and Miller 1944), but by 1976 had "declined drastically" there (Rosenberg et al. 1991), and during the 1980s-2000s only 1-3 pairs could be found on the California side of the river (Unitt 2008). At the same time, however, breeding populations of summer tanagers to the north and west of the Colorado River appeared to be expanding in both range and numbers, from none prior to the 1960s to an estimated 80-90 pairs during the 2000s, about half of which occur along the South Fork of the Kern River on Sequoia National Forest (Unitt 2008). Perhaps reflecting these divergent trends, Breeding Bird Survey (BBS) data (Sauer et al. 2011) indicate non-significant increases in the summer tanager population in California, during both 1966-2010 (of +2.9%) and during 2001-2010 (+2.8%).

Summer tanagers in California breed primarily in riparian forests and river bottoms dominated by cottonwoods (*Populus fremontii*), non-native salt-cedar (*Tamarix*), and other riparian tree species

(Rosenberg et al. 1991, Robinson 1996, Unitt 2008). This species is a medium to long-distant migrant, with most populations (including those of western North America) migrating to the Neotropics for winter (Robinson 1996).

The greatest threat to the persistence of summer tanagers in California is the removal, degradation, or loss of riparian forest. The California state rankings are driven by the population decline well south of the plan area along the Colorado River, their historic breeding range. Degradation includes fragmentation and lowering of water tables. The heat-moderating qualities of cottonwoods and willows are critical for nesting success. Fragmentation can reduce the availability of cooler microsites along rivers. Unnatural water regimes, including floods and extraction of groundwater, have resulted in the loss of most cottonwoods along the Colorado and Mojave Rivers. Invasion of species including tamarisk, Russian olive, and giant reed have displaced suitable summer tanager breeding habitat. Fire is a threat as it typically favors tamarisk at the expense of cottonwood.

Biodiversity Information Serving Our Nation (BISON) database has a total of 5,358 occurrences in California.

Sierra National Forest-specific Rationale

Summer tanagers reach the westernmost extent of their breeding range in extreme southern Sierra Nevada, primarily in tall and extensive cottonwood-willow riparian forests (Beedy and Pandolfino 2013). They breed from mid-May until mid-July and depart by the end of September for wintering areas from Central Mexico to Central America. Overall, summer tanagers are considered incidental on and near the plan area. An entry in eBird from 2012 describes a male summer tanager spotted with a group of western tanagers in the foothills of Hogan Mountain.

For a description of riparian conditions on the Sierra NF, see the section “The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics” in the rationale for willow flycatcher.

The best available scientific information about the summer tanager does not indicate substantial concern about the species’ capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the **summer tanager doesn’t meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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White-faced ibis - *Plegadis chihi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Nothing known in plan area.

Rationale for Species

Species is native to and known to occur in the plan area: Yes

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S3S4

Other Designations: None

Sierra National Forest-Specific Rationale

The white-faced ibis is a common resident of the Central Valley, breeds at a few isolated marshes north of Truckee, and wanders widely after the nesting season. Numbers increased substantially following the banning of DDT. No substantial or local concerns have been noted in the plan area. White-faced ibis is incidentally found on the Sierra National Forest. In eBird, there are 2 records of 2 individuals on the Sierra NF plan area; within 5 miles of and including the forest plan area, there are 2 records of 2 individuals. There are no records in CNDDB for the Sierra NF and no records in NRIS. The best available scientific information about this species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the supporting best available science, **white-faced ibis does not meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Williamson's sapsucker - *Sphyrapicus thyroideus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No known threats in plan area.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: USFWS-BCC

Willaimson's sapsuckers primarily frequent open subalpine forests, especially those dominated by lodgepole pines, and generally nests in red firs of the upper conifer zone. Most nest records are from the lower and upper conifer zones (Beedy and Pandolfino 2013).

Sierra National Forest Rationale

Generally thought to be uncommon residents of the upper conifer to subalpine zones, and rare but annual at low elevation in winter (Beedy and Pandolfino 2013). In eBird, records are distributed across the plan area. The best available scientific information about this species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the supporting best available science, **Williamson's sapsucker does not meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Mammals

American pika[5] - *Ochotona princeps, Ochotona princeps schisticeps*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

[5] Mt. Whitney pika was used as the common name in 2016 rationale document.

Relevant threats to species

Climate change, grazing, proximity of roads to suitable habitat.

Rationale for American pika

NatureServe Global Rank: G5

NatureServe T Rank: T4

State Rank: S2S4

Other Designations: CA-SGCN

The pika subspecies in the Sierra Nevada, *Ochotona princeps schisticeps* (Hefner & Smith 2010), has a global rank of G5 (Secure) and a subspecies rank of T4 (Apparently Secure) (NatureServe 2015). *O. princeps* is recognized as a Species of Greatest Conservation Need and a Species of Special Concern by CDFW. *O. p. schisticeps* has a California State rank of S2S4. *O princeps* has a Nevada State rank of S2.

O. p. schisticeps occupies habitats in volcanic peaks of northern California, throughout the Sierra Nevada of California and Nevada, and isolated highlands throughout the Great Basin of Nevada, eastern Oregon, and southwestern Utah. *O. p. schisticeps* are generally considered restricted to higher elevation (6,700-12,750 feet) sub-alpine to alpine zones where rock and talus slopes are adjacent to meadows, grassland, or forest edges with herbaceous understories (Smith and Weston 1990, Grayson 2005, CDFW 2016). Habitat trends suggest there is less alpine meadow habitat available when compared to pre-European times (Barbour et al. 1991); however, the vegetation types required by this subspecies are not considered a limiting factor.

This subspecies is believed to have received more scientific study than any other American pika subspecies (US FWS 2010), studies that include findings of population declines and range retraction, as well as recently discovered populations in different parts of the Great Basin (Beever et al. 2008, Jeffress et al. 2017).

Threats identified for pikas include climate change, grazing, and proximity of roads to suitable habitat (McDonald 1992, Beever et al. 2003, Stewart et al. 2015, Beever et al. 2016).

Populations throughout the range of this subspecies appear to be stable (Beever et al. 2003, USFWS 2010). There is evidence of upslope movement of pikas presumably in response to warming temperatures at lower elevation sites (McDonald 1992, Beever et al. 2016). Prediction models estimating effects of climate change and the interpretation of such models on pika populations and persistence is mixed. However, based on the number of sites, diversity of sites, occupancy of sites, and elevation range of pika sites in the Sierra Nevada, Millar and Westfall (2010) suggest the greater distribution of pikas in the region may indicate a wide thermal tolerance for pikas. USFWS (2010) concluded that pika populations at mid to high elevations in the Sierra Nevada should not be at risk of extirpation by the year 2050 based on cooler projected temperatures at higher elevations. USFWS (2010) also concluded that lower elevation populations may be at higher risk based on projected warmer temperatures. Stewart et al (2015) modeled future climate change scenarios, projecting the number of occupied sites in the Sierra Nevada may decline from 39 to 88 percent by the year 2070. Millar and Westfall (2010) found pika populations in the Sierra Nevada and southwestern Great Basin are thriving, able to persist in a wide range of thermal environments, and are showing little evidence of extirpation or decline. While there is uncertainty related to climate change effects and pika persistence, it is generally agreed upon that extirpation in mainland areas, such as the Sierra Nevada, have exhibited lower rates of extirpation than more isolated or insular

areas (Beever et al. 2016). Therefore, climate change and habitat availability are not considered limiting factors to the persistence of pikas within the Sierra Nevada in the long-term.

Anthropogenic influences, such as cattle or horse grazing and proximity of roads to habitat may negatively influence pikas (Beever et al. 2003). Beever and others (2003) suggest livestock grazing within 164 feet of cover (e.g., talus habitat) may increase energetic costs and predation risk to individual pikas; but caution further research is needed to determine impacts to populations. USFWS (2010) concluded the potential competition for forage between pikas and livestock is low and is not considered a significant threat to *O. p. schisticeps* throughout its range. Beever and others (2003) suggest the proximity of roads to suitable pika habitat may increase disturbance, remove or isolate remaining habitat, or inhibit dispersal activity; however, the results of human influence on pikas persistence was established at only 3 of 7 unoccupied sites.

Sierra National Forest Rationale

There is a 1916 CNDDB record with a location in the Sierra National Forest plan area, located near Bullfrog Lake. The best available scientific information about the pika does not indicate substantial concern about the species' capability to persist over the long-term in the plan area. Based upon the lack of evidence and supporting best available science, the pika does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Mt. Lyell shrew - *Sorex lyelli*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

There are no major threats to this species, largely due to the remoteness of its habitat.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: S3S4

Other Designations: CA-SSC

The known range of Mt. Lyell shrew is in Yosemite National Park; spans a small area of the east-central Sierra Nevada, California, including areas in and around Yosemite National Park, in Tuolumne, Mariposa, and Mono counties, at elevations of 6,900-10,350 feet. This shrew may possibly occur in similar habitat from Mono County to Modoc County, but the area outside the known range has not been adequately surveyed. Population is considered stable in known range. Surveys along the crest and east slope of the

Sierra Nevada from Mono County north to the Warner Mountains, Modoc County, might yield previously undetected populations. All aspects of life history and population biology are in need of further study.

Sierra National Forest Rationale

There are no known occurrences of Mt. Lyell shrew in the Sierra National Forest. Based upon the lack of evidence and supporting best available science, Mt. Lyell shrew does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

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Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Pallid bat - *Antrozous pallidus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Disturbance of roosting sites. Loss of large trees or snags may reduce the availability of roost structures. May be at risk in the future from white-nose syndrome.

Rationale for pallid bat

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S3

Other Designations: FS-SS; BLM-SS; CA-SSC; CA-SGCN; WBWG-H

The pallid bat has a global rank of G4 (Apparently Secure) and a California State rank of S3 (Vulnerable). The pallid bat is currently a Region 5 Forest Service sensitive species and is recognized as a Species of Special Concern and a Species of Greatest Conservation Need by CDFW. This species has been assigned a High Priority designation by the Western Bat Working Group (2016), indicating this species should be considered one of the highest priority for funding, planning, and conservation actions as it is considered

imperiled or are at high risk of imperilment. The pallid bat is also a Region 5 Forest Service Sensitive species.

Population size is unknown; however, pallid bats are thought to be well distributed throughout California. Short and long-term population trends are considered either stable or slightly declining to an uncertain degree (NatureServe 2017). In urban areas, including Santa Clara and San Diego Counties where urbanization and land conversion have occurred, there is evidence of population declines (Johnston and Stokes 2007 *in* CBWG 2016).

Pallid bats use a wide range of habitats including desert scrub, grassland, oak woodland, and mixed hardwood and coniferous forest (Baker et al. 2008). They are gregarious, roosting in small to large groups, using many different types of roosts including rock crevices, trees basal hollows and cavities, buildings, bridges, and occasionally caves and mines (Barbour and Davis 1969b, Hermanson and O'Shea 1983, Rabe et al. 1998, Baker et al. 2008). Pallid bats use both live and dead trees, roosting in cavities, basal hollows, under loose bark, and even an underground root cavity, (Orr 1954, Rainey et al. 1992, Lewis 1994, Pierson et al. 1996, Rabe et al. 1998, Johnston and Gworek 2006, Baker et al. 2008). They use a variety of tree species for roost sites including oaks, cedar, pine, and even giant sequoia. Similar to roosting, pallid bats forage in a variety of habitat types including open grassland, oak woodland, in forested areas with open understories (Hermanson and O'Shea 1983), and even logging roads (Baker et al. 2008).

The greatest threats to the persistence of pallid bats are those most closely associated with the Central Valley and urban areas, not National Forest System lands. Threats include habitat conversion to agriculture, destruction, removal, restoration/retrofitting, or exclusion from anthropogenic roost sites including buildings and bridges, and to a lesser extent, urban development or forest management resulting in the removal of large hardwood and conifer trees (CBWG 2016). Urban threats including habitat conversion and loss of available bridge and building roost sites are not considered limiting factors to pallid bat persistence within the plan area. Removal of large snags and damaged trees ≥ 61 cm dbh (26 inches) during timber harvest or fires may result in a reduction of roost site availability on National Forest System lands (Rabe et al. 1998, Baker et al. 2008). Because pallid bats are eclectic in their use of a wide variety of roosting structures, the potential loss of some tree roosting sites are not considered a limiting factor within the plan area

White-nose syndrome (a cold-loving fungus that afflicts bats hibernating in caves and mines) is a potential threat that has not yet been detected in California. Pallid bats are not known to be affected by white-nose syndrome (United States Department of the Interior 2014). Pallid bats have been documented to use caves and mines for roosting (Hermanson and O'Shea 1983, van Zyll de Jong 1985). Pallid bats are more often documented using other structures for roosting sites such as trees, rock crevices, and bridges (Hermanson and O'Shea 1983). Based on what is known, white-nose syndrome is not considered a limiting factor for pallid bats in the plan area.

Sierra National Forest-specific Rationale

There are six CNDDB occurrence records from 2002 from the Sierra National Forest; five are located north of Shaver Lake and one is located near the South Fork San Joaquin River. There are two records in the NRIS database for the Sierra NF. The greatest threats to the persistence of pallid bats are those most closely associated with the Central Valley and urban areas, not National Forest System lands. Since they use a wide diversity of roosting structures, threats to tree roosting sites are not considered a limiting factor within the plan area. There is insufficient information to demonstrate substantial concern for long-term persistence in the plan area. Based upon the evidence and supporting best available science, pallid bat

does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Baker, M. D., M. J. Lacki, G. A. Flaxa, P. L. Droppelman, R. A. Slack, and S. A. Slankard. 2008. Habitat Use of Pallid Bats in Coniferous Forests of Northern California. Northwest Science 82:269-275.

Barbour, R. W., and W. H. Davis. 1969. Bats of America. University of Kentucky Press, Lexington KY.

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Johnston, D., and J. Gworek. 2006. Pallid bat (Antrozous pallidus) habitat use in a coniferous forest in northeastern CaliforniaPallid bat (Antrozous pallidus) habitat use in a coniferous forest in northeastern California. Bat Research News 47:46.

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Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Orr, R. T. 1954. Proceedings of the California Academy of Sciences. Volume XXVIII.

Pierson, E. D., W. E. Rainey, and R. M. Miller. 1996. Night roost sampling: A window on the forest bat community in northern California. Pages 151-163 in Bats and Forests Symposium: October 19-21, 1995, Victoria, British Columbia, Canada. Ministry of Forests, Victoria, British Columbia, Working Paper.

Rabe, M. J., T. E. Morrell, H. Green, J. C. deVos, and C. R. Miller. 1998. Characteristics of Ponderosa Pine Snag Roosts Used by Reproductive Bats in Northern Arizona. The Journal of Wildlife Management 62:612-621.

Rainey, W. E., E. D. Pierson, M. Colberg, and J. H. Barclay. 1992 Bats in hollow redwoods: seasonal use and role in nutrient transfer into old growth communities. Bat Research News 33:71.

USFWS. 2014. White-Nose Syndrome The devastating disease of hibernating bats in North America. U.S. Fish and Wildlife Service. in.

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Sierra Nevada mountain beaver - *Aplodontia rufa californica*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Potential for habitat degradation or loss due to anthropogenic factors, narrow habitat requirements, limited dispersal capability, low population densities, low genetic diversity, limited gene flow between subpopulations, water withdrawal, and climate change.

Rationale for Sierra Nevada mountain beaver

NatureServe Global Rank: G5

NatureServe T Rank: T3T4

State Rank: S2S3

Other Designations: CA-SSC; CA-SGCN

The subspecies Sierra Nevada mountain beaver (*Aplodontia rufa californica*) has a limited distribution, occurring only within the Sierra Nevada, in small, somewhat isolated or disjunct areas. The Sierra Nevada mountain beaver has a global rank of G5 (Secure), a subspecies rank of T3T4 (Vulnerable to Apparently Secure), and a California state rank of S2S3 (Imperiled to Vulnerable). This subspecies is also recognized by CDFW as a Species of Special Concern and a Species of Greatest Conservation Need. This subspecies has a Nevada state rank of S1 (Critically Imperiled).

Population trends are unknown but thought to be declining due to anthropogenic factors (NatureServe 2015b). Population estimates are not available for the plan area; however, estimates elsewhere in the Sierra Nevada indicate occupied sites support small numbers of individuals ranging from 1-30 (Steele 1989, Todd 1990, Piaggio and Jeffers 2013). Monitoring of this subspecies indicates fluctuating low numbers and periodic disappearance from sites (Steele 1989).

Available genetic information suggests that there is some degree of gene flow between populations, but there is increasing evidence of isolation between neighboring populations (Piaggio and Jeffers 2013). Piaggio and Jeffers (2013) confirmed low genetic diversity and evidence of population bottleneck amongst sampled populations.

A. r. californica requires cool, moist, high elevation riparian or wet/boggy or spring areas with free flowing water and succulent vegetation (Lovejoy et al. 1978, Beier 1989, Carraway and Verts 1993, Piaggio et al. 2013). Suitable habitat areas are often geographically and topographically isolated from one another, which suggests that habitat for this species has always been marginal and patchy (Beier 1989, Steele 1989). They have very limited dispersal capability due to their fossorial lifestyle, reliance on free water and cool moist habitats, and an inability to disperse across unsuitable habitat in search of mates or unoccupied suitable habitat.

Degradation and loss of habitat has been identified as a threat to Sierra Nevada mountain beavers and has been documented as a source of population declines. The Los Angeles Aqueduct in Mono County and California, utility water storage projects throughout the Sierra Nevada resulted in a reduction (i.e., loss) of suitable streamside habitat required by mountain beavers (Steele 1989). Developments such as ski resorts at Mammoth and June Lakes and urban-recreation developments at Lake Tahoe appear to have negatively affected this subspecies. Negative effects such as habitat degradation and loss described above are evidenced by the apparent loss of known populations (Steele 1989).

Beier (1989) suggests that other management activities such as road construction, livestock grazing, and herbicide applications can influence habitat suitability by reducing soil drainage, altering vegetative species composition and reducing vegetative cover density (Williams and Kilburn 1984). Reduced soil drainage could result in the inability of mountain beavers to dig and maintain the extensive burrow systems they require as primarily fossorial animals. Reducing vegetative composition and cover could negatively affect Sierra Nevada mountain beavers by reducing or removing desired forage species such as alder, aspen, and willow and reducing cover which provides protection from predators.

Sierra National Forest Rationale

There is one CNDDB record from the plan area, it is from 1931 and located in Biledo Meadow. The best available scientific information about Sierra Nevada mountain beaver does not indicate substantial concern about the species' capability to persist over the long-term in the plan area. Based upon the lack of evidence and supporting best available science, Sierra Nevada mountain beaver does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Beier, P. 1989. Use of habitat by mountain beaver in the Sierra Nevada. The Journal of Wildlife Management 53:649-654.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

Carraway, L. N., and B. J. Verts. 1993. Aplodontia rufa. Mammalian Species 431:10.

Gross, S and M. Coppoletta 2013. Historic Range of Variability for Meadows in the Sierra Nevada and South Cascades. 64 pp.Lovejoy, B. P., H. C. Black, and E. F. Hooven. 1978. Reproduction, growth, and development of the mountain beaver. Northwest Science 52:323-328.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Piaggio, A. J., B. A. Coghlan, A. E. Miscampbell, W. M. Arjo, D. B. Ransome, and C. E. Ritland. 2013. Molecular phylogeny of an ancient rodent family (Aplodontiidae). Journal of Mammalogy 94:529-543.

Piaggio, A. J., and J. Jeffers. 2013. On the edge: A genetic assessment of Aplodontia rufa from the edge of their distribution. Western North American Naturalist 73:485-496.

Steele, D. T. 1989. An ecological survey of endemic mountain beavers (Aplodontia rufa) in California, 1979-83 An ecological survey of endemic mountain beavers (Aplodontia rufa) in California, 1979-83

Todd, P. A. 1990. Mountain beavers in Yosemite: Habitat use and management implications of a rare species.

USDA 2016. Draft Environmental Impact Statement for Revision of the Inyo, Sequoia, and Sierra National Forests Land Management Plans. Volume 1: Chapters 1 through 4, Glossary, References, and Index. Pacific Southwest Region. 740 pp.

Williams, D. F., and K. S. Kilburn. 1984. Sensitive, threatened, and endangered mammals of riparian and other wetland communities in California. Berkeley: University of California Press.

Spotted bat - *Euderma maculatum*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

No threats identified in the plan area. Potential for human disturbance at roost sites, loss or degradation of foraging habitat, loss of roost habitat, use of pesticides.

Rationale for spotted bat

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S3

Other Designations: BLM-SS; CA-SSC; WBWG-H

The spotted bat has a global rank of G4 (Apparently Secure) and a California state rank of S3 (Vulnerable). The spotted bat is recognized as a Species of Special Concern by CDFW. This species has been assigned a High Priority designation by the Western Bat Working Group, indicating this species should be considered one of the highest priority for funding, planning, and conservation actions. This species is imperiled or are at high risk of imperilment. According to the Western Bat Working Group, the spotted bat has been listed as a species of concern because of limited information available, and uncertainty as to life history and population trends.

Population size is unknown but this species is not as rare as previously believed and population trend uncertain but probably relatively stable or slowly declining (NatureServe 2015a). Distribution of spotted bats appears to be patchy and limited to areas with suitable roosting habitat, predominately high cliff faces (Easterla 1973, Wai-Ping and Fenton 1989, Navo et al. 1992, Pierson and Rainey 1998a). They forage in a variety of habitats including riparian corridors, forest edges, oak woodlands meadows, ponds, and agricultural fields (Findley and Jones 1965, Berna 1990, Pierson and Rainey 1998a). Foraging habitat is not considered a limiting factor due to the extensive habitats used and their ability to travel one-way distances of up to 25 miles from their roost sites to forage (Wai-Ping and Fenton 1989, Chambers et al. 2004, NatureServe 2015a).

Little is known about possible threats to spotted bats because of lack of knowledge of this species. Because the spotted bat roosts in remote locations, threats to roosts seem unlikely; however, recreational rock climbing may cause impacts in some areas (NatureServe 2015a). Additional threats include; loss or degradation of forage habitat (meadows and grassland open areas) from grazing or other disturbances that result in a loss of native vegetative species and consequently prey species reliant on that vegetation (Pierson and Rainey 1998a), dam construction that inundates high cliffs and canyons that may result in

the removal of roost habitat (Snow 1974), and use of pesticides that may bio accumulate in bats or kill prey species. The magnitude of these threats is considered negligible in the plan area. White-nose syndrome (a cold-loving fungus that afflicts bats hibernating in caves and mines) is a potential threat that has not yet been detected in California, but has recently been documented in Washington State (Sleeman 2016). Spotted bats are not known to be affected by white-nose syndrome. Isolated records have documented spotted bat use of caves and mines for roosting during summer months (Mead and Mikesic 2001, Sherwin and Gannon 2005), but they are most closely associated with cliff faces for roosting habitat (Pierson and Rainey 1998a, Priday and Luce 1999). Based on what is known about spotted bats, these threats are not considered limiting factors within the plan area.

Limestone and dolomite formations occur in the Sierra Nevada, White and Inyo Mountains. Although caves may be naturally limited in the White-Inyo Mountain range (Szewczak 1998). Inventories of abandoned mine features by the Inyo NF are ongoing with roughly sixty percent inventoried to date years (USDA FS unpublished data, C. Garcia pers comm.). In addition, out of 256 abandoned mines surveyed in 2009 two had bats present and suitable habitat, 15 were ranked as having potential bat habitat, 230 did not have any potential bat habitat, and nine did not have information on bat habitat. Of those ranked as having potential bat habitat, seven of those were listed as occupied sites in the 1990s (See the Forest Assessment Topic Paper Chapter 10- Minerals, for more info).

A survey of 100 mines in the Benton Range/Casa Diablo Mountain area in the winter of 1999 found less hibernating bats than in the White Mountains to the east, likely a result of less suitable habitat (drier and less riparian habitat for foraging). In addition mines in that area likely provided moderate sub-surface temperatures; only four mines in the range had temperatures that were below fifty degrees Fahrenheit, the preferred temperature for roosting.

Population trend is unknown though suspected to be stable or only slightly declining. Spotted bats are not as rare as previously believed, they roost in remote locations away from most disturbance sources and have an exceptional foraging range using a wide variety of habitat types. The best available scientific information about the spotted bat regarding relevant threats or other limiting factors does not indicate substantial concern about the species' capability to persist over the long-term in the plan area. Based upon the lack of evidence and supporting best available science, the **spotted bat** doesn't meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Sierra National Forest Rationale

There are four CNDDB records with locations in the Sierra National Forest, all are from 2002. Locations include Jackass Meadow, Balsam Creek, Stevenson Creek by Shaver Dam, and an adit on Million Dollar Mile Road. No threats were identified at these locations. The best available scientific information does not indicate substantial concern about the species' capability to persist over the long-term in the plan area. Based upon the lack of evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Berna, H. J. 1990. Seven bat species from the Kaibab Plateau, Arizona, with a new record of Euderma maculatum. The Southwestern Naturalist 35:354-356.

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Chambers, C. L., M. J. Herder, M. L. Painter, and D. G. Mikesic. 2004. Foraging and roosting sites for male spotted bats (Euderma maculatum) in Northern ArizonaForaging and roosting sites for male spotted bats (Euderma maculatum) in Northern Arizona. Bat Research News 45:211.

Easterla, D. A. 1973. Ecology of 18 species of Chiroptera at Big Ben National Park, Texas. Volume 1-2.Northwest Missouri State University, Maryville, Missouri.

Findley, and Jones. 1965. Comments on spotted bats. Journal of Mammalogy 46:679-680.

Mead, J. I., and D. G. Mikesic. 2001. First fossil record of Euderma maculatum (Chiroptera: Vespertilionidae), Eastern Grand Canyon, ArizonaFirst fossil record of Euderma maculatum (Chiroptera: Vespertilionidae), Eastern Grand Canyon, Arizona. The Southwestern Naturalist 46:380-383.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Navo, K. W., J. A. Gore, and G. T. Skiba. 1992. Observations of the spotted bat, Euderma maculatum, in Northwestern ColoradoObservations of the spotted bat, Euderma maculatum, in Northwestern Colorado. Journal of Mammalogy 73:547-551.

Pierson, E. D., and W. E. Rainey. 1998. Distribution of the spotted bat, Euderma maculatum, in CaliforniaDistribution of the spotted bat, Euderma maculatum, in California. Journal of Mammalogy 79:1296-1305.

Priday, J., and B. Luce. 1999. New distribution records for spotted bat (Euderma maculatum)New distribution records for spotted bat (Euderma maculatum). The Great Basin Naturalist 59:97-99.

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Sleeman, D. J. 2016. White-nose syndrome updates for the 2015/2016 surveillance season. in, U. S. Geological Survey,.

Snow, C. 1974. Habitat management series for endangered species, spotted bat, Euderma maculatum Habitat management series for endangered species, spotted bat, Euderma maculatum

Wai-Ping, V., and M. B. Fenton. 1989. Ecology of spotted bat (Euderma maculatum) roosting and foraging behavior. Journal of Mammalogy 70:617-622.

Trowbridge's shrew - *Sorex trowbridgii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Listed as ICUN - Least Concern because it is widespread, there are no major threats, and its population is not currently in decline.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Trowbridge's shrew is found along the western coast of North America: in the extreme southwest of British Columbia, south of Burrard Inlet; in the western part of the states of Washington and Oregon; and in northern California, the distribution forks with the population continueing south through the coast range to Santa Barbara County, and in eastern California, the population extends south through the Warner Mountains and the Sierra Nevada Mountains to Kern County.

Jameson (1955) reported the Trowbridge shrew common in the coniferous woodlands of the Sierra Nevada, up to elevations of 5000 feet in Plumas County and at least to 6000 feet in Tuolumne County to the south. The forests are comprised of large coniferous trees and smaller deciduous trees and shrubs (*Quercus vaccinifolia, Alnus rubra, Ceanothus* spp*. Cornus* spp*.,* and *Ribes* spp.). The ground litter is composed of the decaying debris from these plants and provides the home and hunting ground of trowbridgei. In areas where the forest has been removed, either by logging or fire, the land is revegetated by brush or small coniferous trees; in these areas shrews persist in lesser abundance. *S. trowbridgei* is not found in wet meadows in the Sierra Nevada like *S. vagrans*; or the water shrew.

Sierra National Forest Rationale

Populations of this shrew on the Sierra National Forest are not surveyed. The best available scientific information does not indicate substantial concern about the species' capability to persist over the long-term in the plan area. Based upon the lack of evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Jameson, Jr., E.W. 1955. Observations on the biology of Sorex trowbridgii in the Sierra Nevada, California. Journal of Mammalogy 36(3):339-345.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Western small-footed myotis - *Myotis ciliolabrum*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

There are no major threats throughout the species' range. Potential threats to bats include habitat loss and non-native disease (e.g., white-nose fungus). Other factors that may affect bats include altered fire regimes, climate change, and pollutants.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S3

Other Designations: None

Western small-footed bats are found across much of the western half of North America, from southern British Columbia and Saskatchewan in the north down to Baja California, Zacatecas, and Nuevo León in the south. They are most common in arid and semiarid habitats, such as deserts, but may be found in pine or juniper forests, and more mesic habitats are used in the southern part of the range (Halloway and Barclay 2001). They are found from 300 to 3,300 m (980 to 10,830 ft). Two subspecies are recognised:

In California, small-footed myotis occurs in coastal areas from Contra Costa Co. south to the Mexican border, and on the west and east sides of the Sierra Nevada, and in Great Basin and desert habitats from Modoc to Kern and San Bernardino Counties. It occurs in a wide variety of habitats, primarily in relatively arid wooded and brushy uplands near water. The summer and winter ranges appear to coincide, but there are few records from winter. This species is found from sea level to at least 2700 m (8900 ft). Individuals are known to roost singly or in small groups in cliff and rock crevices, buildings, concrete overpasses, caves, and mines. There is no Sierra Nevada trend information available for this species.

Sierra National Forest Rationale

There is a CNDDB record from 2002 on the Sierra national Forest, located near Huntington Lake. The best available scientific information does not indicate substantial concern about the species' capability to persist over the long-term in the plan area. Based upon the lack of evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Reptiles

Sierra alligator lizard - *Elgaria coerulea palmeri*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No known threats in plan area.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T4

State Rank: SNR

Other Designations: None

The subspecies *Elgaria coerulea palmeri* is found in the Sierra Nevada Mountains, from Plumas County south to Kern County where it occurs as far south as the Piute Mountains and Breckenridge Mountain. It occurs from 7,000 feet in Tulare County to 4,00 feet in Plumas County. Since it has a broad range along the Sierra Nevada specific threats have not been identified.

It occurs in woodland, forests, and grasslands; commonly found hiding under rocks, logs, bark, boards, trash, or other surface cover. While climate change and stochastic events may disrupt habitat, the species is not restricted to a narrow geographic area. Due to its preference for humid habitats, the lizard may have restricted local range loss due to climate change and long term drought.

Sierra National Forest Rationale

The subspecies *Elgaria coerulea palmeri* is found in the Sierra Nevada Mountains, from Plumas County south to Kern County where it occurs as far south as the Piute Mountains and Breckenridge Mountain. It has a broad range along the Sierra Nevada and specific threats have not been identified. Based upon the lack of evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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California Herps. 2018. Sierra alligator lizard: *Elgaria coerulea palmeri*. CaliforniaHerps.com. http://www.californiaherps.com/lizards/pages/e.c.palmeri.html

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Lais, P.M., 1976. *Gerrhonotus coeruleus*. Catalogue of American Amphibians and Reptiles (CAAR).

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Western pond turtle - *Actinemys* [=*Emys*] *marmorata*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern:

No

Relevant threats to species:

Land use changes, habitat degradation and fragmentation, recreational activities that interrupt feeding and basking, high densities of non-native competitors or native predators, and climate change.

Rationale for Western pond turtle:

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: S3

Other Designations: FS-SS; CA-SSC; CA-SGCN

Western pond turtle has a wide distribution and research is determining genetic differences across this wide distribution (Thompson et al 2016). Western pond turtle (*Actinemys marmorata*) is considered Vulnerable by the IUCN, but according to NatureServe, the global ranking is Vulnerable-Apparently Secure (G3G4), with the following state rankings: Critically Imperiled in Washington (S1), Imperiled in Oregon (S2), and Vulnerable in California and Nevada (S3). The turtle is listed as Endangered in Washington, and carries the designation of State Sensitive-Critical in Oregon, Species of Conservation Priority in Nevada, and Species of Special Concern by the California Department of Fish and Wildlife. In California, the western pond turtle also carries the designation of Species of Greatest Conservation Concern. The turtle was petitioned for listing under the Endangered Species Act in 1998 and, again, in 2012. The 2012 petition has resulted in the U.S. Fish and Wildlife Service conducting a formal status review; currently, the results are pending. The species has notably declined in California in the Central

Valley, San Francisco Bay area, and southern parts of its range, primarily due to habitat loss and degradation and predation by non-native or native predators (Bury et al. 2012). Declines have also been recorded in the extreme northern portion of the species range in Washington (Hallock et al. 2017) and in the Willamette Valley of Oregon where land use changes are increasingly occurring (Rosenberg et al. 2009). In Oregon, the turtle remains abundant south of Salem with large populations in the Klamath Basin and a current distribution similar to the presumed historic distribution (Rosenberg et al. 2009). In California, western pond turtles are still broadly distributed, frequently abundant in the middle and northern portions of its historic range, and likely common on private lands where surveys have not occurred (Bury et al. 2012, Germano and Riedle 2015). Oregon and Washington have recently implemented programs to captively rear eggs (referred to as headstarting) to increase survivorship during the vulnerable early years with the assumed benefit of increasing population sizes (Rosenberg et al. 2009, Hallock et al. 2017).

Western pond turtles are relatively long-lived with some turtles reaching 50 years or more in the wild and survivorship is high for adults (Bury et al. 2012). There are several difficulties in making inferences about population persistence because adult turtles may persist many years after a population has collapsed below the threshold of viability, there is low detection probability in many habitats, and hatchlings and young turtles are difficult to observe and count. Also, there have been very few long-term studies of population dynamics for any given population (Bury et al. 2012). For these reasons, it is difficult to quantify population numbers and trends for this long-lived species. Several researchers have noted apparently high survival and stable populations in both high elevation (Bury et al. 2010, Germano and Riedle 2015) and low elevation habitats (Germano 2016), even in highly altered conditions (Germano 2010). Other information indicates recruitment of young turtles may be occurring at relatively high rates (Cook and Martini-Lamb 2004, Germano and Bury 2009, Bury et al. 2010, Ashton et al. 2015, Germano and Riedle 2015, Germano 2016); but, due to limitations of certain survey techniques that do not attempt to capture the ages of individual turtles (i.e., visual surveys of basking turtles), reproductive success and recruitment is often underestimated and interpreted as populations skewed to adults (Holland 1994, Jennings and Hayes 1994).

Historically, low elevation wetland habitats such as the Great Central Valley were the core range for the western pond turtle in California (Bury et al. 2012). The vast majority of these low elevation wetland habitats has been urbanized or converted to agriculture and the current stronghold for the species has seemingly moved up in elevation and latitude (D. Ashton, pers. comm.). In the Sierran foothills, available habitats for western pond turtles may have increased due to the construction of artificial ponds, primarily used for watering livestock (Germano and Riedle 2015). While many populations occur on lands administered by the federal agencies (Forest Service, National Park Service, and Bureau of Land Management), these populations occur at the historical edges of their range and very little is known about population sizes or demographies. In general, edge populations tend to be more vulnerable to threats than core populations because the animals already experience baseline physiological stress due to natural environmental conditions. The lower elevation flowing waters on lands administered by the Forest Service are frequently intermittent (smaller streams) or modified by dams (larger streams and rivers). The western pond turtle commonly occurs in smaller foothill and mountain streams that may have intermittent flow (Ruso et al. 2017). These habitats may present environmental conditions that reduce body size and condition and increase time in terrestrial environments (Bondi and Marks 2013). Reduced body size and fitness may influence overall reproductive output over a lifetime and increased time in terrestrial environments, especially during summer estivation, may expose individuals to a greater predation or wildfire risk. Habitat fragmentation is an important consideration when attempting to manage habitats for the western pond turtle (Bruce Bury, personal communication). Local turtle populations may be fragmented along a single river by factors such as large reservoirs (examples, New Melones, Isabella, and

Folsom) or by distance if occupied patches are separated by a distance greater than the dispersal capabilities of the species.

Additional potential stressors in the plan area include: forest management activities that directly disturbs terrestrial nest or over-wintering sites; roads (and the associated vehicle traffic) that bisect core aquatic-to-terrestrial pathways increase mortality risk and can skew sex ratios (Steen and Gibbs 2004, Aresco 2005); recreational activities such as swimming and boating that frequently interrupt feeding and basking; reduced aquatic habitat quality due to flow regulation; and high densities of non-native competitors (bullfrogs, red-eared sliders, and fish) or native predators that may be subsidized by human activity (crows, ravens, raccoons and skunks). Disturbance of nests, estivation, or overwintering sites during forest management activities, including prescribed fire, may result in injury or mortality of individuals. Activities that interrupt normal behaviors (for example, basking) can affect basic physiological process such as thermoregulation and increased stress. Predation of nests and individuals by some of these sources has been noted to occur (Holland 1994, Rathbun et al. 2002, Bury et al. 2012) and the effects can be locally important (Holland 1994, Holte 1998). However, the overall effect of predation on population status and demography is unclear due to the persistence of and effective recruitment of individuals into populations co-existing with abundant predators (Rosenberg et al. 2009, Bury and Germano 2008, Bury et al. 2012).

As noted, dams on most major rivers draining the Sierra Nevada are common within the plan area. As a result, the habitat complexity of these rivers and their floodplains has decreased due to extensive impoundment and flow regulations. Some of the impacts to habitats include reduced pool volume, reduced retention of large woody debris, and reduced hydrological connections to off-channel pools (Reese and Welsh 1998, Ashton et al. 2015, Snover et al. 2015). Discharge regimes below dams also affect turtles and their habitats by releasing water colder than would occur in an unregulated state. Colder water has been found to result in reduced body size, a longer time to reproductive maturity in females, fewer gravid females of reproductive age, and increased physiological cost associated with the inability to simultaneously promote both growth and reproduction (Ashton et al. 2015, Snover et al. 2015). The consequences of cold water effects could have long-term population level effects because females would have fewer clutches due to prolonged time to reproductive maturity and clutch size may be smaller (Germano 2010, Snover et al. 2015).

Climate change may be an important variable for many populations of western pond turtle, especially for those occupying intermittent or ephemeral habitats. Declining water levels have been associated with departure from intermittent habitats and estivation in upland habitats, sometimes for periods in excess of 200 days and occasionally for very long times (>600 days) (Rathbun et al. 2002, Bondi and Marks 2012, Zaragosa et al. 2015, Purcell et al. 2017). Under the climate change scenarios predicting lower rainfall or extended drought in the Sierra Nevada, intermittent and ephemeral habitats could potentially provide suitable habitat for shorter periods of time or may not support suitable conditions annually (Leidy et al. 2016, Lovich et al. 2017, Purcell et al. 2017). Several recent studies documented occurrences of possible drought-related mortality events in western pond turtle populations. Purcell, et al. (2017) documented high mortality of turtles in a pond environment following several years of drought. The seasonal pond used by the turtles did not refill annually as is typical, thereby forcing turtles to spend extensive time estivating on land (>400 days) without food or water (Purcell et al. 2017). The authors surmise mortality was due to starvation or predation based on obvious signs of scavenging. In another study, Leidy, et al. (2016) documented extensive mortality in an intermittent stream in California; however, the cause of mortality is unknown but the authors suggest a likely association with impaired habitat conditions created by the drought. Evidence of scavenging was observed for most dead turtles and it is possible that the limited amount of available aquatic habitat increased predation risk for individuals (Leidy et al. 2016). In both instances, turtles were exposed to increased predation risk because habitat suitability was reduced by

lack of water availability. In southern California, Lovich, et al. (2017) documented the collapse of an abundant population of the southwestern pond turtle (*Actinemys pallida*) in four adjacent ponds in southern California, which was primarily due to gross changes in water chemistry associated with prolonged drought and runoff from a wildfire. While the exact causes of mortality are not clear, turtles were in poor physiological condition consistent with lack of feeding – possibly a consequence of the collapse of the food web in the ponds (Lovich et al. 2017). With the potential for more frequent drought periods in the future, and in addition to higher temperatures, natural systems like streams and ponds will be further stressed under changing climate scenarios (Diffenbaugh et al. 2015).

The western pond turtle has a wide geographic range and a wide availability of aquatic habitats throughout its range. The species is long lived with high adult survivorship and can have relatively high reproductive output over the lifetime of an individual. Further, they appear to be capable of persisting and even thriving in marginal and highly modified habitats, including periods of prolonged drought as long as persistent water is available. Several well defined threats are known to impact individuals and the habitats they rely upon which are likely to be exerting stresses on individuals that could cause some local populations to decline over several temporal scales. Populations with low connectivity and at the edges of the range are most vulnerable to stochastic events that could lead to localized extirpations. However, the turtle remains abundant in the central portion of its range and there are large populations with good recruitment at the edges of its range. Also, there are many habitats on private lands where undocumented populations likely occur. The primary limitation about conceding that they are in decline across their range is the lack of sufficient long-term population studies to quantify the extent of those declines. The species receives conservation protections in all states where it occurs in and there are programs to enhance some populations in areas where declines have occurred.

Sierra National Forest-specific Rationale:

The western pond turtle has lost most of its habitat in the Central Valley of California to agricultural activities, flood control, and urbanization. Although most habitat is altered by humans, the Sierra National Forest provides western pond turtle one of its preferred habitats, Sierra Nevada foothill ecosystem type with aquatic habitat. There are over 1,400 NRIS records for western pond turtle on the Sierra National Forest and there are 15 CNDDB records. Many NRIS records are of the same location with repeated sightings. Thompson et al (2016) classified this northern subspecies as Priority 3 (clearly at risk but likely not experiencing substantial and immediate threat of extirpation) and suggest population sizes are stable in several remaining populations in the southern part of the range, and in some areas, declines may have slowed or stopped. They further say unpublished field data indicate the species persist in some numbers throughout Merced and Fresno Counties, as well as some areas of Kern County. On the Sierra National Forest, there is insufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, the western pond turtle does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered:

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Bondi, C. A. and S. B. Marks. 2013. Differences in flow regime influence the seasonal migration, body size, and body condition of western pond turtles (*Actinemys marmorata*) that inhabit perennial and intermittent riverine sites in Northern California. Copeia 2013(1):142-153.

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Holte, D. L. 1998. Nest site characteristics of the western pond turtle, Clemmys marmorata, at Fern Ridge Reservoir, in West Central Oregon. Master's thesis, Oregon State University, Corvallis, Oregon. 106p.
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Lubcke, G. M., and D. S. Wilson. 2007. Variation in shell morphology of the western pond turtle (*Emys marmarota* (Baird and Girard)) from three aquatic habitats in northern California: size and shape variation among three populations. Journal of Herpetology 41:107–114.
Pilliod, D. S., J. L. Welty, and R. Stafford. 2013. Terrestrial movement patterns of western pond turtles (*Actinemys marmorata*) in Central California. Herpetological Conservation and Biology 8(1):207-221.
Purcell, K. L., E. L. McGregor, and K. Calderala. 2017. Effects of drought on western pond turtle survival and movement patterns. Journal of Fish and Wildlife Mangement 8(1):15-27.
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Rathbun, G. B., N. J. Scott, and T. G. Murphey. 2002. Terrestrial habitat use by Pacific pond turtles in a Mediterranean climate. The Southwestern Naturalist 47(2):225-235.
Reese, D. A. and H. H. Welsh. 1998. Habitat use by western pond turtles in the Trinity River, California. Journal of Wildlife Management 62:842-853.
Rosenberg, D., J. Gervais, D. Vesely, S. Barnes, L. Holts, R. Horne, R. Swift, L. Todd, and C. Yee. 2009. Conservation Assessment of the Western Pond Turtle in Oregon. Sponsored by U.S.D.I. Bureau of Land Management and Fish and Wildlife Service, U.S.D.A. Forest Service, Oregon Department of Fish and Wildlife, City of Portland – Metro. 80p.
Rosenberg, D. J. and R. Swift. 2013. Post-emergence behavior of hatchling western pond turtles (*Actinemys marmorata*) in Western Oregon. The American Midland Naturalist 169(1):111-121.
Ruso, G. E., E. Meyer, and A. J. Das. 2017. Seasonal and diel environmental conditions predict western pond turtle (*Emys marmorata*) behavior at a perennial and ephemeral stream in Sequoia National Park, California. Chelonian Conservation and Biology 16(1):20-28.
Snover, M. L., M. J. Adams, D. T. Ashton, J. B. Bettaso, and H. H.Welsh, Jr. 2015. Evidence of counter-gradient growth in western pond turtles (*Actinemys marmorata*) across thermal gradients. Freshwater Biology 60(9):1944-1963.
Spinks, P., R. C. Thomson, and H. B. Shaffer. 2014. The advantages of going large: genome-wide SNPs clarify the complex population history and systematics of the threatened Western Pond Turtle. Molecular Ecology 23:2228–2241.
Steen, D. A. and J. P. Gibbs. 2004. Effects of roads on the structure of freshwater turtle populations. Conservation Biology 18(4):1143-1148.
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Fish

Rainbow trout (Steelhead) - *Oncorhynchus mykiss*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Rainbow trout are placed into streams on the Sierra National Forest for fishing enjoyment. These fish are hatchery fish and are not native to the Sierra NF, therefore there are no relevant threats to this species.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Sierra National Forest Rationale

Rainbow trout are placed into streams on the Sierra National Forest for fishing enjoyment. These fish are hatchery fish and are not native to the Sierra NF. Based upon the lack of evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

San Joaquin roach - *Lavinia symmetricus ssp. 1*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possible eutrophication from erosion and runoff of sediments.

Rationale for Species

NatureServe Global Rank: G4

NatureServe T Rank: T3Q

State Rank: S3

Other Designations: CA-SSC; CA-SGCN

Central California roach are still abundant but there is growing evidence that Central Valley populations may be disappearing one at a time. Surveys in the San Joaquin Valley indicate that roach have been completely extirpated from the entire Fresno River watershed (Moyle 2002). However, there is high uncertainty as to abundance, status and taxonomy of many populations. Specific populations can be isolated due to human habitat alteration (i.e., dams, reservoirs, urbanization, pollution and introduced species) and may be declining. Roach systematics are poorly understood, and there is risk that small distinctive populations may be lost before they can be formally described and provided the protection they deserve as distinct taxa.

Sierra National Forest Rationale

There are no occurrence records for *Lavinia symmetricus* ssp. 1 in CNDDB or NRIS for the Sierra National Forest. There is a 1933 record in BISON that is located along Highway 140. There is a lack of population data. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Terrestrial Invertebrates

Crotch Bumble Bee – *Bombus crotchii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly disturbance, degradation or loss of habitat to microsite conditions due to recreation or mining activities. Loss of habitat due to high-intensity fire, drought conditions and climate change.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: S1S2

Other Designations: IUCN Red List Category: EN – Endangered

This species occurs primarily in California, including the Mediterranean region, Pacific Coast, Western Desert, Great Valley, and adjacent foothills through most of southwestern California. It has also been documented in southwest Nevada, near the California border (Thorp et al., 1983). This bee lives in grassland and scrub habitat types, tolerates hotter and drier habitat types than do most bumblebees, and nests underground. Its food plants include milkweeds, lupines, medics, phacelias, and sages. Although historically common in the Central Valley, it appears to be absent from most of it, especially in the center of its historic range.

Sierra National Forest Rationale

Of 234 occurrences in CNDDB, there are 4 records from the Sierra NF plan area. The exact locations are unknown on these records that were made from 1917 to 1983.

There is insufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

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Sierra ambersnail - *Catinella stretchiana*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly disturbance, degradation or loss of habitat to microsite conditions due to recreation or mining activities. Loss of habitat due to high-intensity fire, drought conditions and climate change.

Rationale for Species

NatureServe Global Rank: G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Catinella stretchiana is known from California, Nevada, South Dakota, Utah, and Wyomoing. In California, there is a 1922 record from the San Francisco area that can be viewed through inaturalist; locations were first described by Binney (1885) as occuring:

> In both Central Province and California Region: Little Valley, Washoe County, Nevada, on the eastern slope of the Sierra Nevada, above 6,500 feet elevation; Mariposa County, California.

Most land snails are foraging generalists and will feed on live and dead material. They are essential in ecosystems as detritivores and decomposers, along with providing a link to ecosystem food chains. In addition, due to limited mobility, home ranges, tend to be very small, only a few acres in some cases (Burke 2013). As a result, microsite conditions may be the most important factor limiting terrestrial snail abundance, since the assemblage of habitat components including access to a substrate of calcareous carbonate (often cliffs habitats or talus slopes), sufficient moisture (even in arid environments), and food consisting of herbaceous materials such as decaying leaf litter are critical for persistence (Burch and Pearce 1990).

Sierra National Forest Rationale

There are no CNDDB records for this species. The location of the occurrence in Mariposa County from the 1885 document is not known. Occurrences, population trends, and threats are unknown in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Binney, W.G. 1885. Bulletin of the United States National Museum No. 28, A manual of American land shells. Department of the Interior, US National Museum. Washington Government Printing Office. Published under the direction of The Smithsonian Institution.

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California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Tulare chrysidid wasp - *Chrysis tularensis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

There are no known threats; general threats may include loss of habitat, adult nectar resources, and declines of host populations.

Rationale for Species

NatureServe Global Rank: G1G2

NatureServe T Rank: None

State Rank: S1S2

Other Designations: None

About 10% of North American Chrysidids are endemic to California, and a very large majority of the others occur in that state. *Chrysis tularensis* is endemic to California, and believed to be restricted to the foothills on both sides of California's San Joaquin Valley. The species is known from five places in four counties: Tulare, Fresno, Monterey, and Amador Counties. Kimsey (2006) mapped one locality actually in the Central Valley. There is one CNDDB record located on the Sierra NF, about 4 miles east of Auberry.

So little information is known about the species that there are no known threats; general threats may include loss of habitat, adult nectar resources, and declines of host populations.

Chrysis tularensis is categorized as a species for which insufficient information exists about status and trends. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Sierra National Forest Rationale

There is one record reported for Sierra NF, with unknown details on location and may be extirpated or possibly extirpated (NatureServe 2017). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Monarch (California overwintering population) - *Danaus plexippus pop. 1*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species:

Habitat loss and destruction, both overwintering habitat and breeding habitat.

Rationale for Danaus plexippus:

NatureServe Global Rank: G4

NatureServe T Rank: T2T3

State Rank: S2S3

Other Designations: CA-SSC; CA-SGCN

The monarch butterfly, *Danaus plexippus*, may be the most familiar North American butterfly, and is considered an iconic pollinator species. The global rank for the species is G4 (Apparently Secure), but it has a T2T3 (Imperiled to Vulnerable) ranks for the California overwintering population. The state ranks is S2S3 (Imperiled to Vulnerable) in California where it is also a CDFW Species of Special Concern and an Invertebrate Species of Greatest Conservation Need. The monarch butterfly is not currently listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or protected specifically under U.S. domestic laws. However, there has been a major push to conserve the monarch butterfly, which has been largely fueled by reports of the declining numbers of overwintering monarchs. Given the concern over the overwintering numbers, the Center for Biological Diversity, the Center for Food Safety, the Xerces Society and Lincoln Brower have filed a petition to the United States Department of the Interior to protect the monarch by having it federally protected and that petition is still under review as of December 2014. The species is a Regional Forester's Sensitive Species for the Los Padres National Forest in Region 5; and a Tuolumne County special status species.

In 2014, President Barack Obama issued a Presidential Memorandum entitled "Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators". The Memorandum established a Pollinator Health Task Force, to be co-chaired by the Secretary of Agriculture and the Administrator of the Environmental Protection Agency, which stated: that the number of migrating monarch butterflies sank to the lowest recorded population level in 2013–14, and there is an imminent risk of failed migration.

The eastern population annually completes a 4,800 km (3,000 mi) migration between overwintering sites in the highland oyamel fir (*Abies religiosa*) forests of Michoacán State in Mexico and southern Canada. West of the Rocky Mountains, monarchs overwinter in sheltered groves along the California coast, where it is considered to be rare with a restricted range. NatureServe provides a global rank of G4 but a rank for the North American subspecies as T2T3 (Imperiled to Vulnerable) and a state rank for California S2S3 (Imperiled to Vulnerable).

Abundance at California winter habitats has been monitored since 1997 at over 170 locales as part of the annual Western Monarch Thanksgiving Counts (See Monarch Watch), analyses indicates that population numbers declined from a high of 1,237,487 monarchs in 1997 to only 99,063 in 2002 (Stevens and Frey 2004). Ongoing monitoring conducted by the Xerces Society and Mia Monroe has determined that the overwintering population in California was 292,674 monarchs in 2015 (Pelton et al. 2016).

Recent declines in monarch overwintering populations along the California Coast have been precipitous: more than one million individuals were counted at 101 sites during 1997, while in 2008 only 130,000 individuals were counted at 115 sites, the majority of which were the same. Even at the most populous sites declines have been about 50%. At the overwintering grove in Ellwood, near Goleta, populations have declined from an estimated 200,000 to 20,000 during this same period. Recently at some groves, monarchs have entirely disappeared and appear to have been extirpated.

Increasing drought conditions in the west seem the most likely system-wide cause for declining populations. In the west, deficits in precipitation have been shown to reduce both milkweed biomass and shorten its late summer availability. Stevens and Frey (2004) reported that that nearly 99% of the variation in western monarch abundance (data for Arizona, California, Nevada, and Oregon) between the El Nino event in 1998 and 2003 was explained by variation in PDSI values, that the extent and severity of the drought increased significantly over this time period and the decline in monarch abundance coincided with increasingly severe drought conditions throughout the west.

The Xerces Society maintains a Western Monarch Overwintering sites Database and reports that the distribution of monarchs among overwintering sites changes over the season and annually, based on regional and individual site conditions. Populations of overwintering monarchs have been declining since regular monitoring began in 1997 (Pelton et al. 2016). In 2016, only 221 of the 412 known overwintering sites were listed as actively occupied. Severe storms in the winter of 2016-2017 have had profound impacts on the eastern monarch population as they overwintered in Mexico, strong storms at the tail end of last season destroyed 54 hectares of monarch habitat in Mexico (Monarch Watch 2017). Winter storms also affected coastal California, but the damage as yet to overwintering monarch populations is unreported.

Sierra National Forest Rationale

There are known records in Big Creek, CA, and in the Sierra foothills approximately 32-48 kilometers (20-30 miles) NE of Fresno, up Tollhouse Rd to where it connects with Hwy 168, then a few kilometers NW up Auberry Rd to about 1371.6 meters altitude. Occurrence records adjacent to Sierra National Forest are located in Ahwahnee Hills Regional Park, Manzanita Lake, Yosemite National Park, and near Friant, Jerseydale and Mariposa, CA (WMMOD 2017). There are no breeding records on Sierra National Forests. There are two known breeding records within 8 kilometers (5 miles) of the forest are located in Yosemite National Park and near Mariposa, CA (WMMOD 2017). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered:

Anderson, J.B. and L.P. Brower. 1996. Freeze-protection of overwintering monarch butterflies in Mexico: critical role of the forest as a blanket and an umbrella. Ecological Entomology 21: 107-116.

Barker, J.F. and W.S. Herman. 1976. Effect of photoperiod and temperature on reproduction of the monarch butterfly, *Danaus plexippus.* J. Insect Physiol. 1916 (22): 1565-1568.

Brower, J. 1958. Experimental Studies of Mimicry in some North American butterflies: Part I. The monarch, *Danaus plexippus*, and Viceroy, *Limenitis archippus archippus*. Evolution 12 (1): 32-47.

Brower, L.P., J.N. Seiber, C.J. Nelson, S.P. Lynch and P.M. Tuskes. 1982. Plant-determined variation in the cardenolide content, thin-layer chromatography profiles, and emetic potency of monarch butterflies, *Danaus plexippus* reared on the milkweed, *Asclepias eriocarpa* in California. Journal of Chemical Ecology 8 (3): 579-633.

Brower, A.V. Z. and M.M. Jeansonne. 2004. Geographical populations and "subspecies" of New World monarch butterflies (Nymphalidae) share a recent origin and are not phylogenetically distinct. Ann. Entomol. Soc. Am. 97(3): 519-523.

CDFW 2016. California Natural Diversity Database (CNDDB): California Department of Fish and Game. https://nrm.dfg.ca.gov/. Accessed 01/14/2017.

Dingle, H., M.P. Zalucki, W.A. Rochester and T. Armijo-prewitt. 2005. Distribution of the monarch butterfly, *Danaus plexippus* (L.) (Lepidoptera: Nymphalidae), in western North America. Biological Journal of the Linnean Society 85: 491–500.

Goehring, L. and K.S. Oberhauser. 2012. Effects of photoperiod, temperature, and host plant age on induction of reproductive diapause and development time in *Danaus plexippus*. Ecological Entomology 27: 674-685.

Lyons, J.I., A.A. Pierce, S.M. Barribeau, E.D. Sternberg, A.J. Mongue and J.C. de Roode. 2012. Lack of genetic differentiation between monarch butterflies with divergent migration destinations. Molecular Ecology 21: 3433–3444.

Monarch-Butterfly.com http://monarchwatch.org/blog/ Accessed 02/24/2017

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org (Accessed: February 24, 2017).

Oberhauser KS. 2004. Overview of Monarch Breeding Biology. Pages 3-7 in Oberhauser KS, Solensky MJ, eds. The Monarch Butterfly: Biology and Conservation. Ithaca: Cornell University Press.

Oberhauser, K., R. Batalden and E. Howard. 2009. Monarch Butterfly Monitoring in North America: Overview of Initiatives and Protocols. Commission for Environmental Cooperation. Montreal, Canada. 55 pp.

Pelton E., S. Jepson, C. Schultz, C. Fallon and S.H. Black. 2016. State of the Monarch Butterfly Overwintering Sites in California. 40+vi pp. Portland, OR: The Xerces Society for Invertebrate Conservation. Accessed at www.xerces.org Jan. 5, 2017.

Stevens, S. and D. Frey. 2004. How the other half lives: monarch population trends west of the great divide. Biological Sciences Department, California Polytechnic State University. San Luis Obispo, California. 7 pp.

Stevens, S.R. and D.F. Frey. 2010. Host plant pattern and variation in climate predict the location of natal grounds for migratory monarch butterflies in western North America. J Insect Conserv. 14: 731–744.

Western Monarch and Milkweed Occurrence Database [WMMOD]. 2017. Data accessed from the Western Monarch Milkweed Mapper, a project by the Xerces Society, U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, and Washington Department of Fish and Wildlife. Available: www.monarchmilkweedmapper.org. Accessed March 14, 2017.

Xerces Society for Invertebrate Conservation http://www.xerces.org/monarchs/ last accessed 02/24/2017.

Zhan, S., W. Zhang, K. Niitepõld, J. Hsu, J.F. Haeger, M.P. Zalucki, S. Altizer, J.C. de Roode, S.M. Reppert and M.R. Kronforst. 2014. The genetics of monarch butterfly migration and warning colouration. Nature 514 (16): 317-329.

Yosemite shoulderband - *Helminthoglypta proles*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly disruption of talus and foraging habitats by cattle grazing, loss of water in riparian zones to agriculture, loss of forests, human recreation, invasive plants, and hot ground fires. The status of all western land snails in different habitats are important indicators of the general ecosystem health.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Yosemite shoulderband, endemic to California, was first described in 1892 from a specimen near Fraser's Mill in Tulare County, at 6,280 freet elevation.

Most land snails are foraging generalists and will feed on live and dead material. They are essential in ecosystems as detritivores and decomposers, along with providing a link to ecosystem food chains. In addition, due to limited mobility, home ranges, tend to be very small, only a few acres in some cases (Burke 2013). As a result, microsite conditions may be the most important factor limiting terrestrial snail abundance, since the assemblage of habitat components including access to a substrate of calcareous carbonate (often cliffs habitats or talus slopes), sufficient moisture (even in arid environments), and food consisting of herbaceous materials such as decaying leaf litter are critical for persistence (Burch and Pearce 1990).

Sequoia National Forest Rationale

There are no records of Yosemite shoulderband occurrences in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Burch, J.B. and T.A. Pearce. 1990. Terrestrial gastropoda. *In*: Dindal, D.L., ed., Soil biology guide. John Wiley and Sons, New York. pp. 201-309.

Burke, T. 2013. Land Snails and Slugs of the Pacific Northwest. Oregon State University Press, Corvallis OR. 344 pp.

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Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A grasshopper - *Hypsalonia petasata*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

There are no known threats; general threats may include loss of habitat.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

The southern Sierra Nevada are notable for endemic grasshopper genera and species of high altitudes. The localized species of Hypsalonia are flightless forms and probably represent post-Pleistocene evolution (Strohecker 1968). *Hypsalonia petasata* is known only from the type locality, an unglaciated tableland above timberline.

Sierra National Forest Rationale

Hypsalonia petasata is known only from the type locality, an unglaciated tableland above timberline. There is no information regarding status and trends. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Strohecker, H.F., W.W. Middlekauff, and D.C. Rentz. 1968. The grasshoppers of California (Orthoptera: Acridiodea). University California Press, Berkeley and Los Angeles.

Orseis crescent - *Phyciodes orseis herlani*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly invasive species, fires, unauthorized OHV use, road expansion, agricultural and urban development.

Rationale for Species

NatureServe Global Rank: G3

NatureServe T Rank: T2T3

State Rank: SNR

Other Designations: None

Phyciodes orseis herlani is easily confused with both pulchellus and mylitta, which both occur with it west of Saddlebag Lake near Tioga Pass. *Phyciodes orseis herlani* represents a distinctive species with orange antennae. A rare and local species in the montane to subalpine ecosystem types. It is found in forests along streams where the host *Cirsium andersonii* grows.

Sierra National Forest Rationale

There is no location information for *Phyciodes orseis herlani* in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Hydaspe fritillary - *Speyeria hydaspe viridicornis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly invasive species, fires, unauthorized OHV use, road expansion, agricultural and urban development.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T1T2

State Rank: SNR

Other Designations: None

Speyeria hydaspe viridicornis occurs in montane and upper montane forests and the hostplants are Violas. This subspecies was once considered to be limited to a small population endemic to the Greenhorn Mountains but is now known to have a very good-sized range and distribution. Although the typical hydaspe species is also present, viridicornis has populations as far north as El Dorado County, California. The best known area in the range is Shirley Meadows in the Greenhorn Mountains, the type locality for Speyeria hydaspe viridicornis. This fritillary appears to be absent on the Kern Plateau but reappears again to the north at Peppermint Creek and Freeman Creek Grove.

Sierra National Forest Rationale

On the Sierra National Forest plan area, occurrence and population trend information are not known. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Davenport, K. 2014. Butterflies of North America 3.4 Butterflies of Kern and Tulare Counties, California. Annotated Checklist of Butterflies of Kern and Tulare Counties, California; *Field Collecting and Sight Records for Butterflies of Kern and Tulare Counties, California;*Butterflies of Sequoia and

Kings Canyon National Parks, Tulare and Fresno Counties, California Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Aquatic Invertebrates

A caddisfly - *Anagapetus chandleri*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Sequoia National Forest Rationale

There is one record of occurrence of this species in the plan area (BISON 2018), from 1946. There is no population trend information. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Dicosmoecus pallicornis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Sierra National Forest Rationale

There are no known locations of this species in the plan area (BISON 2018). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A bushtailed caddisfly - *Gumaga nigricula*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Sierra National Forest Rationale

There are no known locations of this species in the plan area (BISON 2018). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Homophylax nevadensis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G4

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Sequoia National Forest Rationale

There is one recorded occurrence in the Monache Meadows area on the Inyo National Forest, but there are no known locations of this species in Sierra National Forest the plan area (BISON 2018). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Leech's Skyline diving beetle - *Hydroporus leechi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Threats are unknown (NatureServe 2018)

Rationale for Species

NatureServe Global Rank: G3

NatureServe T Rank: None

State Rank: S1?

Other Designations: None

Hydroporus leechi is endemic to California; known from several counties in California, including San Mateo (type locality), Marin, Sonoma, Inyo and Siskiyou ().

Sierra National Forest Rationale

There are no known locations of this species in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A mayfly - *Ironodes lepidus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Ironodes lepidus occurs in California and Oregon. In California, this species is considered to be abundant and widely distributed, it has been documented in a dozen counties: Alpine (Carson River tributary), Calaveras (East Cornell), Fresno (Laurel Creek), Humboldt (west of Hoopa, south of Orleans), Inyo (Silver Cyn), Mariposa (Fish Camp), Mono (Convict Creek, Rock Creek Camp), Plumas (Feather River),

San Bernardino (Barton Flats), Siskiyou (College Grove), and Tulare (Wolverton Creek in Sequoia National Park) Counties (Meyer and McCafferty, 2008).

Sierra National Forest Rationale

There are no known locations of this species in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Meyer, M.D. and W.P. McCafferty. 2007b. Mayflies (Ephemeroptera) of the far western United States. Part 2: Oregon. Transactions of the American Entomological Society 133(1-2): 65-114.

Meyer, M.D. and W.P. McCafferty. 2008. Mayflies (Ephemeroptera) of the far western United States. Part 3: California. Transactions of the American Entomological Society 134(3-4):337-430.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Lepidostoma recinum*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Lepidostoma recinum is found in California, Oregon, and Washington. There is a 1954 collection with no location information in the California Academy of Sciences entomology collection.

Sierra National Forest Rationale

There are nooccurrence records specific to the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Klamath Limnephilan caddisfly - *Limnephilus alconura*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Limnephilus alconura occurs in California, Dolorado, Oregon, and Wyoming. In California, it has been reported in Glenn, Humboldt, Mariposa, Madera, Siskiyou, and Trinity Counties (Ross and Merkley 1952).

Sierra National Forest Rationale

There are no occurrence records specific to the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Ross, H.H., and D.R. Merkley. 1952. An Annotated Key to the Nearctic Males of Limnephilus (Trichopetra, Limnephilidae). The American Midland Naturalist 47(2): 435-455.

A caddisfly - *Ochrotrichia hadria*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G1G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Ochrotrichia hadria is endemic to California. All occurrence records are from Denning and Brickle (1972), from Fresno, Mono, Sonoma, Trinity, and Tulare Counties. There is no population and trend information.

Sierra National Forest Rationale

There are no known locations of this species in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the

long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Denning, D. C, and R. L. Blickle. 1972. A review of the genus Ochrotrichia (Trichoptera: Hydroptihdae). Ann. Ent. Soc. Amer. 65:141-151.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Onocosmoecus sequoiae*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Onocosmoecus sequoiae is endemic to the Sierra Nevada (Wiggins 2000). Wiggins and Richardson (1986) reported occurrences in El Dorado, Fresno, Inyo, Madera, and Tualre Counties. There is no population and trend information on the species.

Sierra National Forest Rationale

There are no known locations of this species in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Wiggins, G.B. 2000. Larvae of the North American Caddisfly Genera (Trichoptera). 2nd ed. University of Toronto Press, Toronto, Canada. 457 pp.

Wiggins, G.B., and J.S. Richardson. 1986. Revision of the Onocomoecus unicolor group. Psyche 93(3-4): 187-216.

A caddisfly - *Rhyacophila chordata*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Rhyacophila chordata occurs in Arizona, California, and Utah. In California, it is reported from Nevada County.

Sierra National Forest Rationale

There are no known locations of this species in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Rhyacophila kernada*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G4

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Rhyacophila kernada has been reported from California, Nevada, and Montana. In California, it was reported in Tulare County by Denning (1956). Apparently not common but presumably occurs more widely than now known (NatureServe 2018)

Sierra National Forest Rationale

The species occurs in Tulare County, but it is unknown if locations are in the plan area. There is no information on population, trends, and threats to persistence. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Denning, D.G. 1956. Chapter 10: Trichopotera. Pages 237-270 in R.L. Usinger (ed.) Aquatic Insects of California. University of California Press: Berkeley, California. 508 pp.

Natureserve. 2018. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 14 June 2018].

A caddisfly - *Rhyacophila neograndis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Rhyacophila neograndis is endemic to California. There are occurrence records in the Sierra Nevada foothills east of Sacramento.

Sierra National Forest Rationale

There are no known locations of this species in the plan area (BISON 2018). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Denning, D.G. 1956. Chapter 10: Trichopotera. Pages 237-270 in R.L. Usinger (ed.) Aquatic Insects of California. University of California Press: Berkeley, California. 508 pp.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Rhyacophila nevadensis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Rhyacophila nevadens is known from Colorado, Nevada and California. In California, it is found in Lassen, Shasta, and Butte Counties (Denning, 1956).

Sierra National Forest Rationale

There are no known locations of this species in the plan area (BISON 2018). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Denning, D.G. 1956. Chapter 10: Trichopotera. Pages 237-270 in R.L. Usinger (ed.) Aquatic Insects of California. University of California Press: Berkeley, California. 508 pp.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Tinodes sigodanus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Tinodes sigodanus is known only from Los Angeles County (NatureServe 2018).

Sierra National Forest Rationale

There are no known locations of this species in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2018. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 14 June 2018].

Other Species

Fisher - *Pekania pennanti*

Type of Animal: Mammal

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern:

Yes

Relevant threats to species:

Loss or degradation of habitat due to uncharacteristic wildfire, vegetation management (e.g., fuels reduction, timber harvest), insect and disease outbreaks, habitat fragmentation, climate change, poisoning from rodenticides, predation, and vehicle strikes.

Rationale for fisher

NatureServe Global Rank: G5

NatureServe T Rank: T2T3Q

State Rank: S2S3

Other Designations: CESA-Threatened; FS-SS; CA-SSC; CA-SGCN

The fisher has a global rank of G5 and the West Coast Distinct Population (WCDP) has a subspecies global rank of T2T3Q (Imperiled to Vulnerable; Q indicates the taxonomic distinctiveness of this entity at the current level is questionable and resolution may affect the current ranking). The WCDP has a California state rank of S2S3 (Imperiled to Vulnerable) and is designated as a Species of Special Concern and a Species of Greatest Conservation Need by CDFW. The California Fish and Game Commission voted to add the fisher southern Sierra ecologically significant unit (ESU), defined as California south of the Merced River, as a Threatened species under the California Endangered Species Act[6] (, with the notice listed on April 20, 2016[7]. The fisher was petitioned for listing under the federal Endangered Species Act in 1990, 1994, and 2000. Following a series of findings and legal actions, the fisher was identified as a threatened species proposed for federal listing in October 2014 but the proposed rule was withdrawn in April 2016. Subsequent court action vacated the 2016 withdrawal and requires reconsideration of the proposed rule to list the species by September 2019 (CITE 2014, 2016, 2019 FRs). This species is also a Region 5 Forest Service sensitive species.

Estimates for southern Sierra Nevada are less than500 individuals (Spencer et al. 2011) and the population in northern California through southwest Oregon is estimated at about 3196 (Furnas et al. 2017) individuals.

[6] http://www.fgc.ca.gov/CESA/Fisher/fisher_findings_part_warranted.pdf
[7] http://www.fgc.ca.gov/CESA/index.aspx#pf

Fishers are most commonly found in low to mid elevation conifer, mixed conifer, and conifer hardwood forests with dense canopy cover. They are solitary animals, have large home ranges, and require large decadent trees (live and dead) and large downed logs used for denning and resting.

Threats to the persistence of fishers have been identified to include loss or degradation of habitat due to uncharacteristic wildfire, vegetation management (e.g., fuels reduction, timber harvest), insect and disease outbreaks, habitat fragmentation, climate change, poisoning from rodenticides, predation, and vehicle strikes.

Vegetation treatments have been identified as a primary threat to fisher persistence; however, these treatments may prevent more adverse effects associated with drought and wildfire. Vegetation management and prescribed fire that result in the degradation of habitat or loss of key ecosystem components such as dense canopy cover, snags, downed logs, and understory vegetation can result in negative short term impacts to fishers and fisher habitat (Truex and Zielinski 2013, Zielinski et al. 2013a, Sweitzer et al. 2016).

(Truex and Zielinski 2013) documented significant negative predicted effects to resting habitat suitability from vegetation treatments that included both mechanical and fire activities. The greatest impact to resting habitat suitability was from the reduction in canopy closure. On the other hand, (Truex and Zielinski 2013) found no significant effects of either solely mechanical or solely prescribed fire treatments on predicted resting habitat value, and no effects of any treatment type or combination on predicted foraging habitat.

Zielinski and others (2013a) sampled fisher home range-size areas (14 km2) for fisher scats, using scat detector dogs, and found that the areas with the most abundant scats had an average of 2.6% of their area disturbed per year (equivalent to 13% over a 5-year period) by a combination of vegetation management treatments. The degree of disturbance within sample units varied widely, suggesting fishers may in some circumstances tolerate higher rates of disturbance. In 1 of 5 high-use units and 1 of 3 moderate-use units, ~6.5% of the area was disturbed annually on average (equivalent to ~ 30% over a 5-year period; Zielinski et al. 2013a). Zielinski et al. (2013a) found no statistically significant difference in the mean area of treatment per year across 3 fisher use categories (high, medium, and low), indicating that vegetation disturbance is only 1 of many factors affecting fisher habitat quality.

Sweitzer and others (2016) found local persistence decreased in areas when hazardous fuels reduction treatments or prescribed fire increased. Specifically, annual disturbance and fuels reduction on 3.2% (single season) and 3.7% (multi-season) of an area 1 km2 in size resulted in reduced use by fishers. There was no evidence that timber removal between 2002 and 2013 resulted in reduced occupancy or persistence on the Sierra National Forest (Sweitzer et al. 2016). The author states this was likely due to several factors including: the extent of extraction was much reduced compared to extraction rates from 1860-2000; delay in implementation may have limited their ability to detect an adverse response; estimates of annual disturbance from extraction for single and multi-season surveys were equivalent to levels tolerated by fishers elsewhere on the forest (Zielinski et al. 2013a), thus the low level of extraction did not impinge fisher use of these habitats.

Garner (2013) found that, although fishers avoid using areas treated for fuel reduction (including mechanical thinning and prescribed fire), their home ranges tend to include larger proportions of treated areas than in the landscape as a whole, and they do not shift home ranges in response to treatments. Garner (2013) concluded that treatments do not render the habitat unsuitable and may, in fact, increase fire resiliency, provided management focuses on surface and ladder fuels.

Habitat fragmentation and loss of connectivity between areas of suitable habitat can pose a risk to the persistence of fishers across the landscape. High severity fire, timber harvest, fuels reduction treatments, road presence and construction, and recreational activities may result in the loss of habitat connectivity resulting in a negative impact on fisher distribution and abundance. Key linkage areas important to maintain or create connectivity between larger core areas of fisher habitat across the Sierra Nevada and Cascade Ranges in California have been identified (Spencer and Rustigan-Ramsos 2012). Genetic connectivity for females is associated with dense forest cover and large trees, and is limited by large water bodies and roads, whereas males genetic connectivity has not been found to be limited by these factors and are more likely than females to disperse between core habitat areas through a wider variety of landscape conditions (Tucker et al. 2017).

Recommendations regarding spreading out treatments both spatially and temporally can be in direct contradiction with creating effective fuels treatments that alter fire behavior on the landscape. However, short-term negative localized effects to fisher from active vegetation management designed to reduce high severity wildfire in and near suitable habitat would out-weigh the positive long-term effects of protecting suitable fisher habitat (Spencer et al. 2008).

Loss of habitat from high severity wildfires is considered one of the most significant threats to the persistence of fishers (Spencer et al. 2008, United States Department of the Interior 2012). High severity wildfires have been increasing over the past several decades and this trend is predicted to continue (Westerling et al. 2006, Miller et al. 2009). Many fires within the current range of the fisher have resulted in the loss of important denning, resting, and foraging habitat. There is no research available regarding fisher use of high severity fire in the first few years after fire. While fisher occupancy was lower in extensively burned forest, they remained present suggesting foraging opportunities remains (Sweitzer et al. 2016). The late seral forested conditions required by fishers could take centuries to return to fire areas that burn at high severity. Wildfire can also result in the loss of connectivity between suitable habitat patches. Maintaining habitat connectivity has been identified as integral in fisher conservation (Spencer et al. 2016).

The potential effects of climate change are complex and not certain. (Solomon et al. 2007) predicted increased risk of extreme weather events such as heat waves, droughts, and floods. Northern California is predicted to have increased winter precipitation and most of California will experience decreased precipitation in the summer months (Lofroth et al. 2010). A warming climate is projected to extend fire seasons and increase total area burned (McKenzie et al. 2004), potentially resulting in direct habitat removal or loss. Less precipitation has resulted in an increase in insect infestations and large scale tree mortality (Taylor and Carroll 2003), resulting in additional loss of habitat and an increased risk of catastrophic wildfire. It is projected that vegetative shifts in response to a warming climate may result in elevational or latitudinal changes in mammal distribution (Kerr and Packer 1998). Potential benefits may include an increase in habitat availability from the predicted reduction in snow pack (Zielinski et al. 2017).

Predation has been documented as the primary cause of mortality of fishers (Lofroth et al. 2010, Sweitzer et al. 2016a). Most likely predators include cougar, bobcat, and coyote (Wengert et al. 2014). Anthropogenic activities, such as vegetation management that removes hiding cover, can contribute to fisher exposure to predation (Lofroth et al. 2010). Roads may also increase the number of lethal interactions between fishers and larger predators.

Rodenticide and insecticide poisoning, most likely in association with illegal marijuana cultivation, has been documented in 85% of fisher carcasses across two project areas in the southern Sierra Nevada and exposure rates to these toxicants has been increasing over time (Thompson et al. 2013). Survival of a

female was found to be related to the number of marijuana cultivation sites the animal was likely to encounter (Thompson et al. 2013). Although more research is needed, it is likely that exposure to rodenticides may predispose an animal to dying from other causes. Effects to fisher populations are unknown at this time.

Vehicle strikes are documented as another source of mortality (Sweitzer et al. 2016a) and road density and construction may contribute to this source of mortality. 24 roadkill deaths in the fisher West Coast population segment have been documented between 1992 and 2014. From what is known, vehicle strikes are not a major source of mortality; however, this source of mortality could be underestimated (Sweitzer et al. 2016a).

Forest-specific Rationale:

Information on current distribution of the species on the planning unit

There are 111 records of fisher in the NRIS database for the Sierra NF, observations run north-south along the eastern and western portions of the forest. The detection rate of fisher on the Sierra NF is roughly half what it is on the combined Giant Sequoia National Monument and Sequoia National Forest plan area (Zielinski et al 2013). Fisher may have increased their spatial distribution on Sierra NF since the mid-1990s (Zielinski et al. 1995, Tucker et al. 2014). The annual occupancy rate within Sierra NF seems to be consistent, though the spatial pattern of detections appears more variable among years than on the Sequoia National Forest. Mark-recapture data collected over the last several years estimate the density of fisher in the Kings River Project area at approximately 1 per 2,500 acres (Mark Jordan, University of California, pers. comm. 2006).

Long term monitoring results indicate that fishers are well-distributed in portions of the Sequoia and Sierra NFs, with annual proportion of sites occupied consistently higher on the Sequoia than the Sierra as shown in table 11. Despite repeated surveys, fishers have not been detected in the central or eastern Sierra Nevada Mountains and from 2009-2011 fisher were reintroduced to the northern Sierras (Sierra Pacific Land) by California Department of Fish and Wildlife. Comparisons to southern Sierra Nevada survey data from the 1990s suggest that the area of occurrence for fisher may have expanded during the past 20 years (USDA-FS 2005, Tucker et al. 2014). Additionally, analysis of the first seven years of the Region monitoring results found that there has been no conspicuous decline in occupancy rates from 2002-2009; no seasonal effects on detection probabilities within the June to October sampling periods (Truex et al. 2009, Zielinski et al. 2013). Results listing the proportion of monitoring units occupied in the fifteen southern Sierra Nevada monitoring seasons to date (2002 to 2009 and 2011 to 2017).

Table 6. Proportion of fisher sites occupied (naïve occupancy) in the Sequoia and Sierra National Forests* and Giant Sequoia National Monument

Year	Sequoia National Forest West Slope	Sequoia Kern Plateau	Sierra NF	Entire Area
2002	0.35	0.10	0.22	0.25
2003	0.45	0.13	0.17	0.25
2004	0.35	0.23	0.13	0.20
2005	0.41	0.26	0.13	0.24
2006	0.51	0.19	0.19	0.29
2007	0.52	0.23	0.15	0.27
2008	0.38	0.14	0.19	0.24
2009**	0.51	0.46	0.10	0.25

Year	Sequoia National Forest West Slope	Sequoia Kern Plateau	Sierra NF	Entire Area
2011***	0.46	0.27	0.30	0.34
2012	0.50	0.20	0.11	0.23
2013	0.48	0.15	0.18	0.27
2014	0.47	0.44	0.24	0.35
2015	0.52	0.22	0.28	0.33
2016	0.47	0.11	0.12	0.22
2017	0.37	0.20	0.28	0.30

*USDA Forest Service data, Tucker pers. comm. 2018. Geographic areas are defined as Sequoia National Forest West Slope (including Hume Lake Ranger District), Sequoia Kern Plateau (the Kern Plateau portion of Sequoia National Forest), and Sierra (Sierra National Forest). Habitat availability and detection rates on the Kern Plateau may be affected by habitat loss due to large fires. In 2007 the SQF West Slope sampling included one unit in Sequoia National Park, and the Sierra NF included six units in Yosemite National Park.

**Sampling effort during 2009 was reduced on the Kern Plateau due to safety and operational considerations. Sampling was limited to the northern portion of the plateau and the observed occupancy is likely higher than it would otherwise have been if sampling had occurred throughout the area as in previous years (Truex, pers. comm.).

*** Survey protocol was revised in 2011 resulting in a different detection probability for the surveys from 2011-2017 compared to 2002-2009. Numbers reported in this table are not adjusted for detection probabilities.

The Kings River Project area is centrally located within the southern Sierra on the Sierra NF and is adjacent to the Sequoia NF. Fishers have been studied and monitored within the Kings River Project area since the mid-1990's (Boroski et al. 2002, Mazzoni 2002, Zielinski et al. 1997, Zielinski et al. 2005, Truex et al. 2008, Jordan 2007, Underwood et al. 2010). Kathryn Purcell from the USFS Pacific Southwest Research Station and Craig Thompson have initiated a research project on fishers in and around the Kings River Project area. Purcell (K. Purcell, pers. comm.) estimated the population for the Kings River Project area alone on the southern Sierra National Forest based on Jordan's (2007) population density estimates. Purcell estimated that 28 to 36 adult fishers occur in the Kings River Project area, and the ongoing research has collected home range and habitat use data on 70 fishers (39 females) in and around the Kings River Project area. Mark-recapture data collected over the last several years estimate the density of fisher in the Kings River Project area on the Sierra NF at approximately 1 per 2,500 acres (Mark Jordan, University of California, pers. comm. 2006).

The Sierra Nevada Adaptive Management Project (SNAMP) monitored fisher populations on a portion of Sierra National Forest from 2007 to 2013. Denning rates were estimated at 84 percent, weaning rates at 70 percent and average litter size was 1.6 kits Sweitzer, et al. 2015). Survival was lowest in the spring to mid-summer time period; the overall survival rate for females was 72 percent and 62 percent for males (Sweitzer, et al. in press).

According to Zielinski et al (2013), the southern Sierra Nevada fisher population does not appear to be expanding its range despite changes in management promoting redevelopment of suitable fisher habitat in the Sierra Nevada (North et al. 2009). In 2017 however, a fisher was detected north of the Merced River in Yosemite National Park for the first time in nearly 100 years (J. Tucker Pers. Comm 2017).

Key ecological conditions for this species (See above for additional information)

Key ecological conditions for fisher include montane forest consisting of low to mid elevation conifer, mixed conifer, and conifer hardwood forests with dense canopy cover (MacFarlane 2010, Zielinski et al. 2004); large decadent trees (live and dead) with cavities (MacFarlane 2010, Zielinski et al. 2004); and large downed logs used for denning and resting. Fisher tend to avoid large open areas (Weir and Corbould 2010). Resting and denning sites are the most critical habitat elements. Fisher requires a relatively large

number of large cavities within their home range and large cavities are typically found in older forests due to natural decay factors (Manion 1991).

On the Sierra NF, the mixed conifer zone typically consists of ponderosa pine, sugar pine, incense cedar, and white fir, and some Douglas-fir. In the montane zone, mid seral coniferous forests comprise 20 percent of the landscape, hardwood and mixed hardwood -conifer forests comprise 15 percent, and late seral closed canopy coniferous forests comprise 11 percent, with shrublands at 10 percent.

In the Kings' River Project area, Mazzoni (2002) found ninety percent of fisher rest sites were in large live trees (mean of 37 inches diameter at breast height) and large snags (mean of 40 inches diameter at breast height). Large logs as well as stumps and rock crevices were also used for resting; dwarf mistletoe brooms also provided important fisher rest structures.

Den sites with tree data collected in the Kings River Project area on the Sierra NF between 2007 and 2010 included use of black oak, white fir, incense cedar, ponderosa pine, and sugar pine. Live black oaks selected as maternal den sites were among the largest oaks used and averaged 34.2 inches in diameter at breast height, while oaks used as maternal den sites were much smaller and averaged 23.6 inches in diameter at breast height. Live conifers used as natal dens averaged 45.2 inches in diameter at breast height, while those used as natal dens were smaller, averaging 37.9 inches in diameter at breast height.

Large diameter black oaks and canyon live oaks compose almost half of the rest sites used by fishers in the southern Sierra Nevada (Zielinski et al. 2004b), while incense cedar were used less than expected. Data are from denning seasons 2008 – 2011 (R. Sweitzer unpublished data). Purcell et al. (2009) determined in the Kings River project study area, fisher rest sites (regardless of species) averaged 37.5 inches for live trees and 46.0 inches for snags. Additionally, from 2007 to 2011, rest sites of all trees in the Kings River Project area averaged 34.9 inches DBH, ranging from 7.8 to 78.4 inches (n = 283). Conifers used as rest sites averaged 37.6 inches while hardwoods averaged 27.9 inches (C. Thompson pers. comm.). Most resting structures used in the Kings River project area were in live trees (76 percent), 15 percent were in snags, 3 were in logs and 2 each were in stumps and rock crevices (Purcell et al. 2009). Mean canopy cover as measured by moosehorn at rest sites was 73.7 percent, compared to random site canopy cover of 55.3 percent (Purcell et al. 2009). The majority (88.5 percent) of rest sites were in habitat with at least 20 percent canopy cover (Mazzoni 2002).

The Southern Sierra Fisher Conservation Area (SSFCA) encompasses the known occupied range of the fisher in the Sierra Nevada. This consists of an elevation band from 3,500 to 8,000 feet (errata March 2001e) on the Sierra and Sequoia National Forests. This area will be managed to support fisher habitat consistent with the protections for the owl. Many of the habitat attributes discussed for the California spotted owl are important to the fisher as well (USDA 2004: p. 7 of ROD). The Southern Sierra Fisher Conservation area (SSFCA) is 720,609 acres across the Forest or 1108 square miles in size (USDA 2017).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Live and dead fuels have increased to abnormally high levels of abundance, greater than the natural range of variability. This results in forests that are highly susceptible to the types of large-scale, high-severity fire that can negatively affect long term forest sustainability and eliminate, or substantially alter, older-age forests that contain large trees that are critical to species like fisher. The Sierra NF landscape has experienced decades of fire exclusion with a mean fire return interval that is highly departed for mixed conifer forests (+40% to greater than 85% mean frequency departure) in most areas of the forest.

According to the California Wildlife Habitat Relationship (CWHR), the majority of mixed conifer, ponderosa pine, and hardwood-conifer (black oak)) is in the medium diameter class (11-24 inch) and moderate to high canopy cover (160,000 acres). A substantial area is in dense canopy, large average tree diameter (93,000 acres). Most of the rest of the area is in low to moderate canopied pole size trees (40,000 acres).

Overall, the number of large trees and snags are low and highly variable across all forest types. In all conifer types, there is less than 5 large trees (less than 30 inch diameter) per acre. In addition, the densities vary radically across the landscape as large trees are not evenly distributed. Most areas have a few large trees per acre and some patches, often previously disturbed (timber harvest or wildfire), have none or they are unevenly distributed across the landscape. Very large tree (trees > 40" dbh) densities are typically less than one to two trees per acre. Again, many areas are devoid of large trees. In conifer-hardwood forests, large tree levels are also somewhat low, with trees < 24" dbh ranging from 4 to 6 per acre. Large snags show similar patterns to large trees, but with lower densities and higher variation. Calculations of snags greater than 15 inches diameter show the range is from 1 to 4 snags per acre in conifer forests. As with large trees, the numbers are lower for conifer-hardwood, generally less than 3 snags per acre and numbers are calculated to be even lower in the oak woodland. Snags are especially variable in distribution with some patches containing large numbers from recent wildfires or where insects or disease killed groups of trees and other areas containing few dead trees. Large snags can stand for longer periods of time (decades) than smaller diameter snags (often less than a decade).

Currently, most of the landscape is not resilient to large, high intensity fire, and is susceptible to drought and insect/pathogen outbreaks. Conifer mortality associated with insects tends to increase whenever annual precipitation is considerably less than historical average (drought). Moisture stress and the frequency and severity of bark beetle outbreaks are projected to increase dramatically with increasing temperatures in the Sierra Nevada, resulting in widespread tree mortality (Bentz et al. 2010, Hicke et al. 2006). This is currently happening on much of the Sierra and Sequoia National Forests in ponderosa pine and lower elevation mixed conifer forests, where the amount of dying conifers is moderate to very high in many areas. These levels are greater than what has occurred in the last 50 years. Portions of the Sierra NF have lost 15-40 trees per acre and some smaller areas greater than 40 trees/acre as a result of drought related mortality.

The projected status of those ecological conditions relative to the species considered

In general, large scale uncharacteristically severe wildfire poses a risk to fisher denning and resting habitat, as well as habitat connectivity (Lofroth et al. 2010). These fires are expected to increase in frequency and intensity, bark beetle outbreaks are expected to further exacerbate already dry conditions. Future projections estimate that bark beetle and other forest insect activity will increase because of climate changes such as elevated temperatures, frequent drought, and current high risk conditions (dense vegetation) of western forests (Bentz et al. 2010). Forest Health Monitoring risk maps (USDA FS 2012b) show substantial risk of increased tree mortality (greater than 25 percent basal area lost) in the next 15 years due to bark beetles and other pest complexes (see maps in the Insect and Pathogen supplemental report). Droughts may become frequent and prolonged, and it can be expected that mortality will be proportional (Smith 2007). Warming and drying climate are expected to greatly increase the likelihood and risk of widespread and elevated insect and pathogen outbreaks (Fettig 2012).

The following estimates from the living assessment snapshot, show projected trend (2012-2032) for each forest type potentially used by fisher. Approximate percentage of each habitat type on the Sierra NF are in parentheses.

Oak-associated Hardwoods and Hardwood/Conifers (15.1): Declining trend, major change not expected however, large scale, high intensity fire in a warming climate can lead to shifts from conifer forests to hardwood dominated forests.

Coniferous Forest, Early Seral (3.4): Decreasing trend most likely due to fire suppression, salvage logging, and natural succession shifting forests into mid-seral condition.

Coniferous Forest, Complex Early Seral (Unknown): Decreasing trend due to past fire suppression, salvage logging, reforestation (by humans), and mechanical thinning.

Coniferous Forest, Mid Seral (19.9): Gradual decreasing trend. Major loses are projected if large scale, high intensity fires occur in these forests due to high fuel loads.

Coniferous Forest, Late Seral, Closed Canopy (11.5): Gradual increasing trend as the large amounts of mid-seral stands progress into late-seral forests. The continued management framework would retain nearly all trees >30 inches dbh, thus increasing the number of stems per acre.

Coniferous Forest, Late Seral, Open Canopy (0.2): This small amount of habitat is predicted to remain stable although possibly increasing as a result of closed canopy forests shifting into open canopy forests as a result of potentially increased mortality.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Climate change. The implications of climate change are unclear for fisher. Fisher might benefit by a reduction in deep snow and increases in mast-producing hardwoods. However, increases in the rate of loss of mature trees with cavities and fragmentation by creating open canopied areas from wildfire could reduce habitat.

Loss of Connectivity: Connectivity of old-forest associated species like fisher is high on the Sierra NF; there is no road that crosses the mountains on the Sierra NF and there has been an absence of large, stand-replacing fires for over 50 years. However, high intensity fire may pose a future risk to connectivity. Weather conditions conducive to intense fire are already increasing with climate change and are expected to increase in the future. Connectivity of early seral habitat, particularly complex early seral habitat is unknown but likely limited due to fire suppression and past forest management.

Rodenticide poisoning. Exposure suggests that anticoagulant rodenticide (AR) contamination is widespread within the fisher's range in California and points to illegal marijuana cultivation as a likely point source. Gabriel et al. (2012) documented exposure to AR on the Sierra NF in the SNAMP and Kings River Project Areas.

Predation. The Kings River Project has confirmed 27 mortalities (14 males and 13 females) since the inception of the project (Thompson et al. 2009). Twenty-two of the mortalities (81 percent) can be attributed to predation, with bobcats and mountain lion as the main predators (Thompson et al. 2011).

Road related mortality. There is no road that crosses the mountains on the Sierra NF, however, State Highway 41 and State Highway 140 access the northern half of the forest and State Highway 168 access the southern portion. The forest has approximately 180 miles of double lane paved roads which are considered main line arterials. The forest also has two Forest Service designated national scenic byways

(NSB). Fisher have been killed along roads by vehicles primarily on Highway 41 where it extends across Sierra NF and Yosemite NP. Some attempts to reduce this risk have included placing signs and reducing speed limits, as well as identifying high priority travel corridors and developing culvert passageways under roads.

Fire Suppression and Vegetation Treatments: Past fire suppression has led to losses in landscape-level ecosystem heterogeneity. The SNAMP (http://snamp.cnr.berkeley.edu/) conducted an intensive investigation into fisher use of habitat and response to management disturbance, largely on the Bass Lake Ranger District of Sierra NF. They assessed fisher occupancy in relation to fire history, elevation and canopy cover and evaluated the response of fishers to fuel reduction activities. Fishers used areas with higher canopy cover and occupancy was lower in areas with active recent fire histories (both natural and prescribed). Persistence was lower in areas with more fuels reduction activities. They speculated that fishers would resume the use of treated areas within a few years (Sweitzer et al. 2016). Conservation Biology Institute (CBI) modeling results suggest that fuels treatments will have little effect on fishers, either positively or negatively, at the regional scale. However, if fires become larger and more severe in the future, CBI analysis results suggest that carefully planned and implemented fuels treatments may reduce overall fire risks and help to sustain fisher habitat and populations. Modeling has suggested that large, high severity fires can have significant, negative impacts on fisher habitat quality and population size (Scheller et al. 2011, Thompson et al. 2011). However, restoration is proceeding at a pace and scale that is inadequate to address the problem in a timely way. The limited pace and scale of restoration and lack of active management is a stressor.

Research and planning related to the Dinkey Landscape Restoration Project on the Sierra a NF has focused on designing and evaluating suitable vegetation management practices that can reduce the threat of habitat loss from uncharacteristic wildfire while retaining suitable habitat conditions. Recent research highlights the importance of fine scale and landscape scale heterogeneity and the role that understory cover plays in fisher use of den sites across their home range.

The Sierra NF moved away from even-aged reforestation management 20 years ago to stand maintenance thinning harvests intended to control density and growth of stands. This was done generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production. It also increases growth rates on the remaining trees. Remaining trees grow larger and faster than those in untreated stands. For restoration purposes, in several vegetation types, especially mixed conifer, reforestation implemented in a group selection, all-aged silvicultural application can increase stand heterogeneity and manage stands for resiliency and wildlife habitat. These patches would create early seral stage patches of shrub or younger age class trees. Within the mixed conifer, about 90 percent of the lands are classified as saw timber stands, eight percent in pole stands, and only three percent in the seedling or sapling stages. Increasing early seral stages would address restoration of vegetative characteristics concerning issues such as hiding cover by providing patches with more diverse understory cover.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Fisher occupancy rates on the Sierra NF appear stable, but risk factors are numerous, and fishers occupy less than fifty percent of their historic range and are subject to exposure to high levels of environmental toxicants resulting in both lethal and sublethal effects. As a result of over a century of fire suppression coupled with the effects of increased drying, large stand replacing wildfire is likely to increase in frequency and intensity. Climate change and associated bark beetle outbreaks have and are expected to continue to add stress to the mixed conifer system. This type of disturbance puts fisher habitat at future

risk of loss of key forest structures, such as large trees with cavities and mature mast-producing hardwoods, and increases fragmentation. Because there is no road that crosses the mountains on the Sierra NF, the forest may be especially critical as movement corridor for fisher throughout its range in the Southern Sierras. For all these reasons, there is substantial concern about this species' ability to persist on the planning unit and adjacent landscape. Based upon the evidence and supporting best available science, this species does meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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